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CHOLERA

AND

ITS PREVENTIVE AND CURATIVE TREATMENT.

BY

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WITH AN INTRODUCTION

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NEW YORK:
A. L. CHATTERTON PUBLISHING COMPANY,
No. 166 GREENWICH STREET.
1884.

THE CHAS. M. GREEN PRINTING CO.,
74 AND 76 BEEKMAN STREET,
NEW YORK.

IN CONSIDERATION OF

FRATERNAL LOVE AND RESPECT THIS LITTLE WORK

Is Affectionately Dedicated

TO

P. K. RÂY, D.Sc. (LONDON AND EDINBURGH),

BY HIS YOUNGER BROTHER,

The Author.

PREFACE.

I BEGAN to collect the materials for this work on "Cholera and its Preventive and Curative Treatment" during my residence in India, my native country, where, especially in Bengal, the dreaded pest is never absent. It is needless to state here how virulent is its nature and how destructive its effect when once it obtains a footing; the average mortality ranging from twenty-five to eighty per cent. America has also suffered somewhat at long intervals, and its appearance at the present time in different European countries has given just cause to fear that it may again make its appearance here. Statistics show the probability of this visitation, for, in the past, whenever it has raged on the European coast it has usually found its way across the ocean, defying nearly all precautionary measures. We read in every day's paper accounts of its ravages, and that it is spreading fast. I therefore consider that this is the proper time to make public the result of my observation and experience. If it shall be of any use to the profession or the public, I shall feel myself amply repaid for the trouble it has cost me—which is more than my readers may know, for the reason that

I have been compelled to express myself in a language other than my own.

I take this occasion to extend to Professors S. P. Burdick and S. Lilienthal my grateful acknowledgment for many courtesies extended to me, both in connection with this little work and otherwise.

My obligations to Professor Malcolm Leal call for my strongest acknowledgment. My best wishes in all things will attend him always, and his friendship I shall retain as one of the pleasantest reminiscences of my sojourn in this city.

Professor Allen, to whom I am indebted for the accompanying Introduction, as well as other evidences of kindness, is entitled to and will forever have my warmest friendship and esteem.

My inclination leads me to name many other friends and acquaintances whose considerate treatment and kindness have made pleasant and profitable my stay in this city. To each of them I extend my thanks.

DWARKÂ NÂTH RÂY.

NEW YORK, 131 East 27th St.,
July, 1884.

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INTRODUCTION.

My good friend and former pupil, Dr. Dwarkâ Nâth Rây has asked me to introduce his work to the public, which I am the more willing to do as his labor has been largely under my own eye and partly in my library, and I can vouch for his fidelity and zeal. It seems peculiarly fit that a native of India should undertake a work on Cholera, and in this instance, prepared as it is by one of high caste in his own country, educated also in England and in America, there is every reason to believe that it will command the respect of his countrymen, as well as of his co-laborers the world over.

T. F. ALLEN.

CHOLERA

AND

ITS PREVENTIVE AND CURATIVE TREATMENT.

I. Synonyms.

In the nomenclature of diseases the following names occur for cholera: Asiatic Cholera; Serous Cholera; Spasmodic Cholera; Malignant Cholera; Cholera Asphyxia; Epidemic Cholera; Algide Cholera; Blue Cholera, or Cholera Morbus.

II. Definition.

It is a specific epidemic or endemic disease, especially the former, characterized by the development of the following symptoms: The patient at first complains of a feeling of uneasiness, which is soon after followed by nausea; a feeling of oppression or pain at the pit of the stomach; constant vomiting; frequent watery discharges with or without griping pain in the abdomen; scantiness or suppression of urine; profuse perspiration and great prostration; the hands and feet are shrivelled; eyes are sunk deep in their orbits; the general countenance becomes anxious and aimless; soon follow the cramps and twitching of the muscles

in the different parts of the body, especially the limbs; there is difficulty in breathing; the pulse is rapid, small, and compressible; the voice becomes husky and sometimes quite suppressed; the temperature of the body begins to fall rapidly; the extremities are quite cold, and the patient passes into a state of collapse. The severity of the symptoms differs according to the mode of invasion, which is sometimes very rapid and at others slow, with symptoms ill-developed. So in some cases the disease terminates fatally within six to twelve hours, while in others it lasts a little longer; but even in favorable cases the patient suffers a good deal.

III. History.

It would be idle to attempt to state the exact date when and the place where the disease propagated first. But it is pretty certain that it was known to the ancients at an early period, for the descriptions of a disease of like nature are met with in ancient medical works of the Hindus, the Arabians, and the Chinese in Asia, as well as in the works of the Greeks and Romans in Europe.

Professor Hirsch reports that Asiatic cholera spread over India, Persia, and Constantinople as early as 1031 A.D. But Dr. Macnamara does not agree with him; he is of the opinion that no description of true Asiatic cholera in Europe was known before 1679. Even as to this fact there is some doubt and controversy; this so-called cholera was stated by some to be a severe

form of dysentery. This is, I believe, most likely true, as there is no report of its appearance throughout a large extent of country, while on the contrary it had been stated that the malady was confined to a limited area in London; hence, as it was not an endemic or sporadic disease of this country, it might be well said that it was not an outbreak of true Asiatic cholera, so well known by its epidemic nature beyond its endemic area.

But in India the description of the disease in all its true character was reported as early as 1503. Succeeding this period, it seems to me, the disease has broken out in an epidemic form in different parts of the country, and in some parts it assumed an endemic form; it was known as an endemic disease amongst the natives of Amboo Valley in Arcot in 1770. During the period from 1771 to 1783, cholera was prevalent throughout the Travancore country, Ganjam, Coromandel coast, and Calcutta, and spread northward as far as Hurdwar, where, in 1783, it cut off twenty thousand pilgrims, and extended as far south as Ceylon. Since then it has been flourishing all over the country with more or less severity. Several cases of true cholera were reported here and there in different parts of the country during the years from 1809 to 1817. It was subsequent to the latter date that the great outbreaks occurring simultaneously in different parts of the Old Continent drew the minds of people to its closer study and investigation.

A great many superstitions and anecdotes are con-

nected with the great cholera epidemic, which first broke out somewhere near Jessore, a town in Bengal, in August, 1817. This epidemic within three months spread throughout the whole province and its vicinity; almost every town in lower Bengal shared its deadly poison; Calcutta, Dacca, Mymensingh, Jessore, and Chittagang, etc., were its special victims. But the provinces beyond, such as Behar and Orissa, were not exempt from its terrible ravages, for Bhagalpur, Monghyr, Purneah, Dinapoor, Belasore, and Cuttack were equally affected. The terrible outburst of cholera in the camp of the Marquis of Hastings, the then Governor-General at Bundelcund, on the 7th of November of the same year, led to the supposition of various conditions on which depended the morbid poison. I would like to devote an entire chapter to the discussion of the various theories which have been propounded up to the present day. At present I shall trace the disease and the manner in which it spread, in the course of a few years, over the greater part of the Old Continent. Somehow or other cases of cholera were reported from different villages and towns of Bengal, Bombay, and Madras provinces. This extension from one place to another was either due to the direct communication of people or to a contaminated atmosphere which carried the poison; but whatever might have been the means of communication, cholera was prevalent along the eastern and western coasts of India in 1819. So these places, especially lower Bengal, which has been called by Dr. Macpherson the home of chol-

era, have suffered repeated attacks of its outrages periodically; so this section of country may be well said to be the endemic seat of cholera. It often extended beyond its endemic area. During the year 1820, when it was still prevalent on the western coast, the English Government was compelled to despatch a fleet from Bombay to Arabia. Shortly after its arrival at Amon, cases of cholera were reported all over, and soon similar reports were recorded from Bassora on the Persian Gulf, in 1821. Thus through the caravans the disease has been carried as far as Astrakhan, beyond which, in Russia, no cases have occurred. It is said that its further progress had been checked by the precautionary measures taken by the Russian Government in anticipation of the evil effect, but what they were we could not say; however, it is true the disease did not go further then.

We must now return to the history of the epidemic of 1817, which spread in other directions. During the year 1820, soon after the arrival of the British vessels from India at Bankok, the capital of Siam, this country was absolutely devastated by cholera; it appeared at the same time in Malacca, Penang, Singapore, and Java. In all these places the malady was communicated by trade. It extended also into China and Russia. It first appeared on the shores of the Yellow Sea, ravaged the neighboring province of Chantung, and then turned northward to Pekin, and after crossing the Great Wall followed the course of the caravans as far as to the Russian Empire.

It is also important to trace the disease to the African coast. During the year 1819, cholera spread from the south of India into Ceylon; at that time a vessel having some cholera patients on board sailed from Tricomalee, on the 9th of October, and on the arrival of the ship at Mauritius the disease made its appearance among the inhabitants of the latter place, whence it was taken to Zanzibar, on the east coast of Africa, in 1820.

Succeeding the cholera epidemic (1817–21), it was mostly confined to its endemic area, though occasionally extended beyond the limit. Thus, in 1826, Bombay Presidency, Sinde, and Panjab were under its influence; during the following year it travelled through Cabul and reached Herat and Khiva. On the 26th of August, 1829, the disease broke out at Orenburg, a frontier town of Russia, through mercantile transactions, and this was the first place in Europe that had been affected by Asiatic cholera. So it prevailed over many provinces of Russia, as well as the neighboring countries, in 1830.

It now remains for me to trace the continuation of this epidemic from India through Europe to America. While epidemic cholera was prevalent in Arabia and Persia, it advanced northwestward as far as Novgorod and Moscow, and then made its appearance at Constantinople in July, and at St. Petersburg in June, 1831, continuing its work of destruction during the months of July and August. It then marched westward and reached Vienna and Berlin. So, Hungary,

Bohemia, and Germany suffered from its virulent attack. In August, 1831, cholera appeared at Sunderland, though we have no evidence of direct communication of the virus from any affected place. Subsequently it appeared at Newcastle, Gateshead, Edinburgh, and in London. We have already seen that cholera failed to spread beyond Germany in 1831, but the following year, in March, it burst out in Paris, and was communicated to Ireland; when, after having depopulated many of the principal towns, it reappeared in England. In 1832 a ship set sail from Dublin with patients affected with cholera, and on her arrival at Quebec cholera broke out among the inhabitants of the city. This was the beginning of the disease in America, and occurred in June of the same year. From Quebec the disease travelled to New York and Philadelphia, and spread over the greater part of the United States before the end of the year.

But the disease still remains untraced to the most western part of Europe—that is, Spain and Portugal. It has been observed that these countries escaped the influence of the epidemic until the year 1833, when a merchant-steamer set sail from England on the 25th of December, 1832, and arrived at Oporto after having lost several passengers by cholera. This was the cause of the outbreak of cholera in Portugal. As to Spain, though the Spaniards rigorously enforced the quarantine,—and so severe was the law that its infringement was punishable by death,—in spite of all precautions cholera raged with great violence in many of the prov-

inces of Spain in 1833–34. It then assumed its course towards the coast of Europe, and visited many of the ports, such as Venice, Trieste, and Naples, as well as Rome, in 1836; and also many of the islands of the Mediterranean, as Malta and Gozo in 1837.

At this time, also, the eastern shore of Africa was under its influence. Most likely the poison was communicated from India, particularly from the Malabar coast, where the malady had been very severe in 1833–34, and extended in Africa precisely in the same way as in Europe.

Having traced the extension of cholera all over the globe, I give in an abridged form the dates of its occasional epidemic invasions in different countries:

In 1840 cholera prevailed in lower Bengal; in 1840 (April) in Singapore; in 1842 (August) in China; in 1842, Burmah; in 1843, abated all over; in 1844–45, Central India, Cabul, and Persia; in 1847 (October), Constantinople. In 1848–49 this epidemic was very violent in Austria, Turkey, Russia, Germany, and England, and then across the Atlantic in America (New York, New Orleans, and Canada). So, Dr. Macnamara says that this epidemic extended over a greater area of land than the epidemic of 1831–32. In 1850, broke out in Egypt and all over the northern seaport towns of Africa, Mexico, and California; in 1851, very much subsided all over; in 1855–56, from India spread to Persia, Arabia, and Africa; in 1860–61, Panjab epidemic in India; in 1862, China; in 1863–66, Bengal, Bombay, Arabia, Africa, Europe

(especially Italy, France, Spain, and Portugal), West Indies, and America; in 1871–72, Asia Minor, Austria, Hungary. In 1873 the epidemic spread from Calcutta to America by voyage, and damaged the latter very much. In 1883, the late epidemic of Egypt.

IV. ÆTIOLOGY.

Now comes the question, Did the malady that infested the whole globe originate in one place and subsequently spread throughout the world, or did it genèrate *de novo* in the different localities where it made its appearance? Though there are differences of opinion as to this statement, it is pretty certain that it originated at first in India, where it raged for a certain length of time in an epidemic form before it assumed an endemic character. In the other places where it appeared from time to time in an epidemic form it never assumed an endemic one.

This distinctly shows that the origin of the disease was always connected with some infected area, from which favorable circumstances facilitated its rapid progress in different directions. It is also evident from the history of cholera that there has been communication between an infected area and a non-infected before the latter has been subjected to the outrages of the malady. But it is not unlikely that when once it spread over the whole globe it may have selected some suitable soils for its new home, and the subsequent attacks take place under the same conditions as those which give rise to the malady in lower

Bengal, the supposed home of cholera. I do not see any reason why this should not be the case; so, as regards the different epidemics, we are not justified in tracing their origin in all cases from their home, though Dr. Macnamara has attempted to do so in all epidemics that have taken place up to the present time, and denies that any special condition of the soil or any other circumstances have ever been known to originate Asiatic cholera *de novo* among men removed from its endemic influence. Authorities have failed to trace in this last epidemic in Egypt any connection either directly or indirectly with the endemic area (Bengal), and have declared that it must have originated somewhere in Egypt.

Cholera is an acute specific disease. The nature of the specific poison is at present quite unknown, though various theories have been propounded at different times to show the true nature of the poison; nevertheless much has been said regarding it, so I think it will be better to lay those various theories before you.

The most prominent theories are the following:

1. Blood-poisoning theory of Dr. G. Johnson.
2. Drinking-water theory of Drs. Bayer and J. Snow.
3. Fungus theory of Drs. W. Budd, Farr, and several others.
4. Damp-subsoil theory of Prof. Pattenkofer.
5. Dr. Bryden's theory.
6. Dr. Pacini's theory.

7. The vibrionic theory of Dr. Macnamara.

8. The bacillus theory of Dr. Koch and his colleagues.

Now I shall consider each theory by itself.

1. *Blood-poisoning Theory of Dr. Johnson.*—The main theory is that the phenomenon of cholera results from the entrance of a morbid poison into the blood, either through the lungs or through the gastro-intestinal canal; that, when in the body, it undergoes rapid proliferation and thus destroys the blood-constituents, which are then ejected through the alimentary canal. His theory is based upon the following facts:

(*a*) Preceding the symptoms of cholera there are symptoms of general malaise such as are met with in all other diseases which are due to blood-poisoning; in other words, the disease has a period of incubation marked by malaise.

(*b*) The same view may be inferred from the fact of albumen being present in the urine in cholera as in diphtheria and other zymotic diseases.

(*c*) The copious discharges from the intestines are the efforts of nature to eliminate the poison from the system and thus to cause recovery, and consequently if the secretion be checked the risk of fatal collapse is greatly increased.

(*d*) In many cases the poison may be inhaled as well as swallowed. If this be the case, the blood-poisoning theory is correct as a whole, and the constitution must be affected before the development of the intestinal symptoms.

(*e*) The specific poison of cholera exercises influence on the arterioles of the lungs and causes spasm of the muscular coats of these vessels. This leads to the imperfect aëration of the blood, and there is produced a venous congestion of the right side of the heart and therefore systemic poisoning. Relying on these facts, Dr. Johnson administered purgatives, such as castor-oil, etc., as remedies, which assist the action of nature in draining away the specific poison.

Objections to the Theory.—With regard to this elimination theory Mr. J. Simon, one of the greatest of the living pathologists, says: "The belief that a primary blood-poisoning is the proximate cause of cholera, the direct source equally of its intestinal and asphyxial manifestation, is, so far as I know, a mere hypothesis. It has been much accepted as the only possible explanation of certain supposed facts, but very questionable facts in the natural history of disease, especially in explanation of the supposed fact that the utmost collapse of cholera may concur with little or no affection of the intestinal canal." "The notion of a primary blood-poisoning in cholera seems tending more and more to be superseded."

Secondly. Dr. Thudichum has analyzed the blood, and says that there is no chemical evidence of the presence in the blood of any particular poison.

Thirdly. The experience of a vast number of practitioners in India and elsewhere shows that the astringent treatment by checking the evacuations affords the patient the best chance for recovery. If this be true,

as there is no doubt that a vast number of lives are saved in cholera by checking the disease in its early stages with opium and astringents or with opium or sulphuric acid, it is then evident we are acting against the blood-poisoning theory.

Fourthly. Building upon the blood-poisoning theory, it has been said that the most fatal cases are those in which patients rapidly pass into collapse, or who suddenly die without collapse or evacuations. It is argued from this circumstance that the poisoning here produces such an overwhelming action that the prostration comes on with great rapidity without first producing choleraic discharges, just as prostration may be produced in small-pox without any eruption. Two points are to be noticed here: (1) It may be a question of time; a patient may have vomited and purged before being observed or attended to—that is, there may have been rapid vomiting and purging before the coming on of the collapse. (2) Very often when during life succumb comes on rapidly without any discharges, post-mortem examination shows that the intestines are soiled with rice-water stools, so that they are not evacuated.

Fifthly. The question of the influence on the arterioles of the lungs is a mere hypothesis. It is assumed to explain certain changes that the lungs undergo from the cholera poison. But this may be explained in a different manner; moreover it is difficult to see, if it be a poison, why it should affect the arterioles of the lungs only and not the other parts of the body. In direct

opposition to this blood-poisoning theory, the state of collapse and other similar symptoms in cholera may be traced to a draining away of the serum; the blood, thus robbed of its liquid constituents, which cannot be restored through the diseased mucous membrane of the alimentary canal, becomes thickened, like tar or treacle. This state of the blood not only accounts for the symptoms mentioned, but impedes the circulation and leads to a cessation of life. This was the view held by the opponents of this theory.

2. *Drinking-water Theory.*—In 1832, during the cholera epidemic of 1831–34, M. Bayer, a Frenchman, propounded a theory tracing the disease to a miasm which was contained in the water of tardy and boggy pools. These pools and marshes liberated the miasm during the evaporation of water, and thus produced the disease. In London, during the epidemic of 1848–49, Dr. J. Snow said that the specific poison of cholera contained in the stools and vomited matter acted directly on the intestinal mucous membrane, when swallowed by persons predisposed to the malady, in the same way as the poison of small-pox or scarlet fever, and then in passing out again with stools into water and reaching the alimentary canal of another person would give rise to similar conditions. Both these observers found drinking-water to be the cause.

3. *Fungus Theory.*—This was held by Dr. W. Budd, of Bristol, in 1849, as the cause of disease. He believed that the disease depended upon a distinct species of fungus, which being swallowed, infinitely

multiplied in the intestines, produces symptoms of the disease. These living organisms are disseminated by contact with food, principally through drinking water of the infected places. Here, then, the active poison was considered to be a fungus acting on the mucous membrane of the intestines, brought there by means of drinking-water, and then propagating the disease. This theory did not originate with Dr. Budd, for, in 1839, Boehm, a German observer, described certain cryptogamic vegetations in the epithelial débris of the choleraic stools. These were micro-fungi; some of them were round, oval, elongated, and others beaded, and found in all the vomited matter and ejecta, as well as in the intestinal canal. Drs. Thomson, Hassels, Swayne, and others accepted the same view, as did also Dr. Farr, in 1852, the Registrar-General of London, who, in reporting the causes of cholera, said that some organic material acting as a zymotic agent was developed in the blood, and hence produced the morbid condition of the blood. This principle he termed "cholerine." The London College of Physicians were also of opinion that "the theory that the cause of the disease is a general state of atmosphere," a general "atmospheric influence," or "epidemic constitution," has been found untenable; they believe "that human intercourse has at least a share in the propagation of the disease, and that under some circumstances it is the most important if not sole means of effecting its diffusion;" "the poison attaching itself to the surface of the bodies, to the walls of the rooms,

and to the furniture, it will also be collected by the clothing of persons living in the infected dwellings, will be carried by them from place to place, and wherever it meets with conditions favorable to its increase and action will produce a fresh outbreak of the epidemic." The College, however, observe: "It by no means follows that cholera is always propagated in this way. It may spread independently of communication between the sick and healthy. The agent, then, most likely to have conveyed the poison from one spot to another is the wind."

Now, as regards the fungus theory, it can be well said that the careful investigations of Drs. Lewis and Cunningham in India have failed to detect any such organisms.

4. *Damp-Subsoil Theory.*—Professor Pattenkofer, of Munich, in 1855, held the theory that (*a*) the development of cholera depended upon certain conditions of the soil. He believed that the subsoil water was engaged in the propagation of cholera. With regard to the subsoil water, he says that cholera is due to the specific organic matter brought into the ground by cholera evacuations—either stools or vomited matter; (*b*) that this material in the soil undergoes certain fermentative changes, so that the evolution of the poison is associated with a certain degree of moisture in the subsoil. If the subsoil be too dry or too moist, then the poison is not produced, but remains dormant for any length of time, until appropriate damp subsoil excites its development. The most favorable con-

dition for the development of the poison is the damp subsoil—that is, when the water sinks after a previous rise; so that the soil is the true nidus, and especially when it is sufficiently porous and alluvial to be penetrable by the decomposed excrementitious products. When once developed, the poison may be carried in various directions, naturally in the direction of the water-course of the country. The poison required air, water, and soil for its fructification. It is possibly associated with a certain meteorological condition of the atmosphere, and, lastly, certain predisposition with respect to the individual or patient. Pattenkofer says that the poison does not consist of the ejecta of the patients, these being innocent with respect to propagation; but it is only when the ejecta pass into the soil, and there meeting with appropriate conditions of fermentation, give rise to the development of the poison.

With respect to the nature of the poison, Dr. Pattenkofer denies that impure water or organic matter in the subsoil water can develop such poison, but he believes that the ejecta are absolutely necessary.

Objections to this Theory.—The objection to this theory is that Dr. Pattenkofer said that the best time for the development of the poison is when the subsoil water is sinking. Now it is well known that water under such circumstances becomes impure. Depending on his own hypothesis, it is a question, as Virchow asks, whether it is not the impure water which takes certain part in the propagation of the poison; for the outbreak of cholera, it has

been frequently observed, occurs when there is impurity of water. Besides, the theory is based upon the statement that the porous soil is capable of developing cholera, whereas statistics show that even in soil where the geological formations are altogether different, as in the rocky and granitic soil, such as Bombay and Panjab, cholera is developed. The theory is quite applicable in Bengal, because here the poison is devoloped in the porous delta of the Ganges; but such a theory would not explain its development in a soil of different character. Again, from the record of the India Government it would be seen that there is no connection with the rise or fall of subsoil water to the development of cholera, as it is developed at one time with high and at another with low subsoil water.

5. *Dr. Bryden's Theory in* 1868.—Dr. Bryden states that the Bengal Presidency may be divided into two subdivisions—a lower province, or the area of endemic cholera, namely, where cholera is a constant visitor; and an upper. In the former the cholera germs lie hidden in the ground, and he regards the development of cholera as a vital phenomenon, just as the budding of a plant; therefore cholera is developed in lower Bengal and is conveyed with the regularity of an epidemic outbreak—that is, with certain periodicity—to the upper province. He also mentions that the epidemic period ceases from the first week of October to the third week of April, during which time the disease is prevalent in the lower province, the upper province being entirely free. But after this period,

again, from the beginning of May, there are distinct systematic periodic visitations in the upper province; moreover, the parts which the disease visits first are the environs of the epidemic area, from whence it spreads further and further to the northwest and northeast. There is, according to him, a specific miasm generated which is cholera poison. The most suitable vehicle of carriage is the atmosphere when in a certain condition. Thus the monsoon carries it from the endemic to the epidemic area. Human intercourse, he says, is capable of spreading it, but the most common way is by the atmospheric diffusion.

6. *Pacini's Theory.*—Dr. Pacini, in 1863, first made an original inquiry into the causes of cholera. He starts (1) with the view that the cholera poison is a fungus; (2) that this fungus acts primarily upon the absorbing epithelial lining membrane of the gastro-intestinal canal; (3) that it destroys the epithelium and thus converts the absorbing surface into a transuding one; (4) that when this is converted, the flux that takes place at the outset of cholera is due to the mechanical process of transudation. Thus when it becomes so severe that the transuding surface exceeds the absorbing one, the recovery becomes almost impossible, unless after a time coagulations or thrombi are formed in the mesenteric vessels, preventing further transudation; and then the fluid may be absorbed from the muscles and other tissues into the blood-vessels, as shown by the shrivelled appearance of the body in this stage. This is an attempt of nature to produce equi-

librium in the system; and should it not take place, the blood, being deprived of its watery constituents, becomes so thick that it cannot circulate through the capillary blood-vessels; consequently death ensues.

7. *The Vibrionic Theory of Dr. Macnamara.*—He holds Pacini's view with certain modifications. He says that the poison of cholera is derived from the ejecta but not in a fresh state. In order that the poison may be developed there, ejecta should undergo certain vibrionic stage of decomposition—that is, a decomposition in which vibriones may be developed. In order that this may take place the ejecta should be placed for two or three days at a certain temperature. If in this state they are swallowed as Dr. Macnamara says, either with food or with drinks (water, milk, etc.), then the poisoning will take place and cholera be the result. But if the vibriones go beyond this stage, they are absolutely harmless; therefore it is only in the middle stage that they are poisonous. According to him, the material may be dried up for a considerable time, but when moisture is again introduced it undergoes vibrionic stage of decomposition and produces the poison; when swallowed it produces the same vibrionic changes in the mucous membrane of the bowels, and alters the epithelial absorbing surface so that it becomes a transuding one, in the same way as Pacini has shown; the result being the outpouring of serum through the thin wall of the bowels. The blood is now imperfectly aërated and its corpuscles diminished; the

movement in the capillaries is arrested, and at the same time the circulation is impeded by the hydrostatic pressure in the vessels. With this the contracting power of the heart is diminished, so that the patient rapidly sinks and dies; unless, as Pacini has shown, nature comes to the rescue by the formation of thrombi, when life may be saved by drainage of fluid into the vessels from all other tissues. So that Macnamara's views are a short step in advance of Dr. Pacini's, inasmuch as he says that the poison consists of organic matter in a state of decomposition. He agrees with Dr. Farr with regard to the vehicle, and believes with Dr. Snow that it is a zymotic principle, and with Dr. Pacini in regarding the intestinal mucous membrane as the primary seat. So his views are the admixture of those of the several other observers.

8. *The Bacillus Theory of Dr. Koch and his Colleagues.*—The bacilli as the origin of cholera have created a great sensation in the medical world, and all reports on that subject are read with great interest by the profession. Dr. Koch and his colleagues, who had dissected the dead bodies of nine cholera patients in Calcutta, in all cases, with the aid of the microscope, discovered the existence of the same bacilli as they found in Egypt last year. In their report of September, 1883, they were unable to decide whether these bacilli did not belong to the regular parasites of the human gut, and only under the influence of the cholera disease had crept into the mucous membrane of the intestines. Of late they have de-

cided that these bacilli are the origin of cholera. Their report goes thus: "There is a lack, then, of sufficient symptoms to distinguish these bacilli from others very similarly formed. But this want has now, happily, been supplied, for with the help of the methods devised by the Board of Health, which on this occasion have proved very serviceable, we succeeded in isolating the bacilli from the intestinal contents of the purest cholera cases; and minute observation of these bacilli, under our treatment, led to the discovery of some very characteristic qualities as to their form and growth in gelatine, which enabled us with certainty to distinguish them from other bacilli. And now we had the means of definitely deciding the question whether these bacilli belonged to the regular inhabitants of the intestine, or whether they occurred exclusively in that of cholera patients. And first of all, with the help of our gelatine preparations, we demonstrated the existence of these bacilli in the evacuations of all the cholera patients we examined, as well as in the intestinal contents of those who had died from cholera in a similar manner. We then examined the intestines of other corpses, and in every case the bacilli in question were absent from the intestine. Thus far we have examined the bodies of eight persons who died of pneumonia, dysentery, phthisis, and kidney-disease, as well as of several animals, and other substances abounding in bacteria; but nowhere did we find in them anything like our cholera bacilli. Should this phenomenon prove constant in the course of the

further investigation, a very important result will thus have been attained; for if bacilli of a specific character are exclusively incident to the process of cholera, the original connection between the appearance of these bacteria and the disease would scarcely admit of any doubt, even if the reproduction of the disease in animals did not succeed. But even in the latter respect things seem to be in our favor, as some of the experiments made on animals have yielded results which allow us to hope for further success."

"*The Englishman*, of Calcutta, states that Messrs. Koch, Fischer, and Gaffky, the members of the commission sent by the German Government to Egypt and India to investigate the origin and causes of cholera, have succeeded in discovering the cholera germ in a tank of water at Calcutta. . . . . These bacilli have been found in the matter contained in a tank used by a suburban village where cholera lately appeared, and their connection with the disease thus established."

As to this theory I have not much to say, as it still requires further investigation. Professor Koch is decidedly of opinion that Asiatic cholera is a disease that is caused by specific micro-organism (bacilli), and in this respect he is completely in accord with Dr. Macnamara, though this gentleman failed to isolate the specific germ or to induce cholera in any of the lower animals. Dr. Koch, however, believes that he has isolated the specific micro-organism of cholera; and further, that he has succeeded in holding this parasite

in pure cultivation, and in instituting experiments with these cultivated organisms on lower animals. We hope he will succeed in his further investigation. If these bacilli be the origin in the production of cholera, there is no doubt that this is a grand discovery, and the profession owes a great deal to the discoverers. Now we want a germicide for the practical test of the discovery.

All these theories have been brought forward from time to time, yet all are open to objection. However, it is supposed by all observers that the virus originates in the ejecta of an affected person, but how it originates and how it acts or what it is we cannot dogmatically assert, as it has been found over and over that the disease is produced where individuals are not exposed to such excrementitious matter, while, on the other hand, the disease attacks to a very slight extent those persons who are constantly exposed to excreta, such as nurses, coolies, and methors who remove the ejecta. So, whatever may be the nature of the poison, the disease is unquestionably an infectious one, has a period of incubation varying fron twenty-four hours to two or three days, but seldom longer (in epidemics it varies), one attack is not a prophylactic for a second; and it runs a definite course, though often irregular.

V. The Modes of Propagation.

The disease is capable of being transmitted from one person to another, but is not a contagious disease in the ordinary sense. This is principally communicated—

(1) By contact, particularly by human intercourse, as has been shown in various epidemics: the principal means of communication were caravans, pilgrims, voyages, and trade, etc.

(2) By atmospheric taint, that is, when the atmosphere becomes so thoroughly contaminated with the poison of an infected area that it carried the poison to a non-infected area; as the direction of the wind or monsoon sometimes shows the course of the epidemic.

3. By drinks, such as drinking-water, milk, or other drinks, principally the first. The poison is drained through the soil into the well-water or river-water that is used for drinking purposes, and thus enters into the system.

4. By various articles, such as bedding, clothing, and other articles that come in contact with the ejecta of the cholera patient.

5. As we are quite ignorant of the nature of the poison, we are not able to say how it enters into the system; probably it is either swallowed, inhaled, or absorbed by the skin.

VI. The Predisposing Circumstances.

1. All ages, including new-born children, and both sexes are liable to the disease.

2. Epidemic constitution is the most common predisposing cause.

3. A simple diarrhœa in a patient during an epidemic may develop into a malignant form of cholera.

4. The individual proclivity.

5. Bad hygiene, overcrowding, living in close and ill-ventilated rooms, intemperate habits, and drinking tainted water, are some of the common predisposing causes.

It is due to the impurity of drinking-water that the disease occasionally breaks out twice in a year in those districts of Bengal which are subjected to inundation; once with the coming of the flood, when the vegetable and other decomposed organic matters make the water quite filthy, and again with the decline of the flood, when also the drinking-water becomes thoroughly saturated with organic matter and quite unfit for drink.

Now, again, the outbreak of cholera due to overcrowding and the tolerance of other filthy habits will be evident if we refer to the statistics of the great fairs (*mahla*) that annually take place in Bengal and other parts of India. This fair, which lasts for a long or short duration, becomes the centre of the disease. There people throng together from different quarters by hundreds and thousands, and, returning to their homes, give rise to several foci. I can say certainly that this has been the case for several years in Bengal, not a single such occasion being excepted. But now the strict observance of the hygienic principles on such occasions, under the supervision of the police authority, has greatly reduced the mortality; still I believe that the number of deaths from cholera in those fairs much exceeds those from any other disease.

6. The new-comers into an affected locality are peculiarly susceptible to the disease. This can be ex-

plained by the fact that it is more apt to be fatal at first outbreak than in the subsequent attacks.

7. Persons suffering from nervous depression, due either to fatigue or debauch, are particularly apt to be attacked by cholera.

8. It is supposed that the development of poison is retarded at a temperature below 40° F. or above 212° F., but it is most favorable when exposed to the sun at 80° or 90° F.

Too much exhaustion, fatigue, overwork, misery, and anxiety, especially during the epidemic, may be classed under the predisposing as well as exciting causes.

VII. Exciting Causes.

I have often noticed during cholera epidemics that when the disease breaks out in a village there are almost invariably certain quarters that suffer more than others. So certain sections of a town called in Bengal, Bazar, tola or para, become the special centres of epidemics, while other sections occasionally almost entirely escape. There must be some special exciting cause in such centres.

The common exciting causes of cholera are improper foods, such as decaying vegetables, unripe fruits, uncooked or improperly cooked food, decomposed animal diet, especially meat or fish. The latter is a very common exciting cause of cholera in certain towns or villages of lower Bengal, where, during the prevalence of the disease, the poorer class of people, who, owing to their humble circumstances, eat putrid

fish indiscriminately day after day, are especially subject to its attacks. I do not mean to say that this is the only exciting cause, but surely upon this depend other exciting circumstances common to hovels. Dr. Carpenter quotes Dr. Britain as an authority for the fact of an outbreak of cholera and choleraic diarrhœa among a number of school-children who had eaten plentifully of spoiled oysters and contracted the disease, by which eleven of the sufferers lost their lives.

Besides, intemperance in eating or drinking, want of proper food or insufficient diet, or anxiety and sleeplessness, may excite the disease.

VIII. Symptoms.

The symptoms are usually developed gradually, and according to their development the disease may be divided into stages: first, the stage of invasion; second, the stage of development; third, the stage of collapse; and fourth, the stage of reaction.

First Stage.—Previous to the onset of this stage there is a period of incubation, varying from twelve hours to two or three days, but, as I have said before, seldom exceeding this period. There is hardly any distinction between this stage and the stage of invasion; however, this period is characterized by malaise, soon after which the patient experiences the prominent symptoms of the invasion of the disease. In a typical case of cholera the following symptoms are generally noticed: Following the feeling of malaise there are general uneasiness, depression of spirits,

sense of exhaustion and debility, inaptitude for any occupation, anxiety, restlessness, slight oppression in the epigastrum, giddiness, ringing in the ears, heavy feeling in the head, and often headache. Then gradually creep the other symptoms, such as relaxation of bowels; this lasts for a few hours or days before the actual attack comes on. The stools at this period are semi-fluid or sometimes watery, three, four, or more in twenty-four hours, accompanied with griping pain in the bowels and sometimes heat in the anus. The appetite becomes dull, tongue clear and moist; nausea, with occasional vomiting, and the patient complains of thirst; sometimes severe vomitings precede the purgings.

As regards the development of these symptoms there is no regularity; sometimes they appear very quickly, and at others very slowly. Sometimes some of them are very prominent and persistent, while others are ill-developed. During this stage there is nothing very characteristic as regards the other systems of the body. The duration of the stage of invasion is quite uncertain and varies greatly in individual cases. It may last from a few hours to two or three days, but during the epidemics it is often absent.

Second Stage.—The second stage is known as *the stage of development or evacuation.* There is no regularity in the passage of the disease from the first stage into the second; sometimes it is very quick, while at others gradual. In whatever manner it passes into this stage, early morning is considered as a favorable period. Copious watery purging is the characteristic sign of

its onset. But in cases where first stage is suppressed, the first one or two stools consist of the ordinary contents of the intestines, or of undigested food mixed with large quantity of fluid. The stools are thin, watery, pale, slightly opaque, sometimes whitish or somewhat milky, containing sediments of minute flaky particles of food, alkaline in reaction (specific gravity varies from 1005 to 1010), and resemble very much the water in which rice has been boiled, and hence called the *rice-water* evacuations. Microscopically, this discharge consists of abundant granular matter, a few epithelial cells, vibrios, bacteria, and bioplasm; chemically, mostly water and a considerable quantity of various salts, such as soda, potash, and chloride of sodium, with albumen and other organic matter. This *rice-water* stool is very characteristic of cholera. Shortly after there is frequency of evacuations at short intervals; with it sometimes diminishes the quantity of evacuation, and there may be experienced much pain or no pain in the abdomen. The character of the pain is very variable; it is often keen, sharp, and excruciating. Repeated vomiting is another most troublesome symptom, the attacks being in quick succession, if there has been none before. This vomited matter is bile-stained water, comes out with considerable force, and leaves a foul, bitter taste. The attacks of vomiting are not so numerous as the purgings; they are often excited by the introduction of any articles, as medicine or food or drinks. While vomiting and purging are continuing the patient feels excessively

thirsty, the thirst is unquenchable, and the patient becomes quite exhausted. The general appearance of the patient is much altered; the eyes begin to sink, and there are marked dark rings around them, and they look staring. At this time the temperature of the body begins to fall and sinks to a few degrees below normal. With the diminution of bodily warmth the external surface of the body, especially the distal parts, as the hands, feet, nose, ears, lips, and the tip of the tongue, give evidence of coldness, while the rest of the body is pretty warm. The voice now gradually loses its normal tone, and the patient feels exhausted in speaking, but can speak well. The pulse loses its normal character, it is small, weak, thready and compressible, and may entirely disappear from the wrist for a considerable time. One more prominent and distressing symptom of this stage is cramps. They begin in the extremities, frequently in the fingers and toes, and gradually travel along the limbs, or may appear simultaneously in the calves of the legs, the thighs and arms; they often occur in the muscles of the abdomen. These painful cramps often last until the next stage, if the patient does not succumb before it is reached.

This second stage, in fact, is very perplexing to physicians, as it oscillates between good and evil; at one time it gives hope of improvement and recovery, at another there seems to be imminent danger of collapse. This stage, with its stationary period before it takes a definite course, lasts a few hours or sometimes a full day.

Third Stage.—The third stage, *the stage of collapse or algide stage.* If the case does not turn favorably and so escape the third stage, which is much more dangerous than the last, the purging and vomiting of the second stage continue. They are much less frequent and less copious, and their consistency greatly varies. The stools may be either a frothy liquid, whitish or brownish slimy matter, greenish watery liquid, or there may be a little clear liquid with gelatinous mucous, inodorous at first, but later on becoming very offensive. There is intense thirst, the patient is eagerly craving drink; but drinks only relieve the thirst temporarily, and immediately after the same thirst returns. Sometimes there are cramps of greater or less severity. When this stage is fully developed the general appearance of the patient is as follows: the body is quite emaciated, the surface livid or pale, and the fingers and toes are blue and shrivelled; the hands and feet assume a wrinkled appearance, as if they had been soaked in water for a long time. On touch, there is a feeling of icy coldness almost all over the body; the external temperature of the body goes down several degrees below normal, sometimes as low as 82° F. in the axilla, generally 95°, 96°, or 97° F. The whole surface of the body is bathed in a cold, clammy perspiration. This is generally noticed first on the forehead at the root of the hairs, then extends over the whole face and also over the chest. The cardiac power is greatly diminished, the heart's sounds are scarcely distinguishable; the pulse is absent at the wrists, and

in bad cases even imperceptible in the brachial and carotid arteries. The eyes are sunk deeply in the orbits and encircled by dark areola, the eyelids are generally half open, and the pupils usually contracted, though dilated pupils are not uncommon. The lips and tongue are cold and dry; there is a choking sensation in the throat, with inability to swallow; the voice becomes feeble, hoarse, and husky, sometimes quite suppressed. The secretion of urine, which was less in quantity and pale in last stage, becomes quite suppressed now. The patient feels quite restless in his bed—in fact, torture in his bed, constantly desires to change sides, but feels great exhaustion when doing so; in some cases the prostration is so great that the patient is unable to change his place in the bed without help; sometimes he complains of excessive heat and throws off any wrapper or covering from his body as if in a frantic fit. Further on comes the critical stage when the muscular strength of the patient is either very much reduced or, occasionally, so extraordinarily increased as to enable him to sit up in bed or run across the room. Sometimes, as I have said, the pupils are dilated; the eyeballs move round or are quite steady; the sight becomes dim, so that sometimes the patient cannot recognize the neighboring objects. The nose and the infra-orbital regions become very prominent, and the general appearance death-like. The whole body is of a dusky hue, and is covered with a cold and clammy perspiration. The respiration becomes labored and rapid. There is ringing in the ears and deafness

may supervene. As a rule, in most cases the patients do not lose their consciousness. The stools are gelatinoid or mucous in consistence and small in quantity, half passed in bedclothes and the rest is retained in the intestines owing to the inability of the muscular coats of the bowels. Thus sometimes there is an accumulation of the transuded fluid in the canal, and the abdomen thus becomes distended and tympanitic. This is entirely due to the partial or complete paralysis of the muscular coats of the bowels. The physicians find it most difficult to move the bowels in such a state. This state seldom lasts more than a few hours, but may last twelve to forty hours or even more. When all the attendants and relations are anxiously watching, the attending physicians have given up almost all hopes of recovery, and all the symptoms point towards immediate death,—even then the case sometimes turns favorably and enters the stage of reaction, of which I shall speak presently. But in unfavorable cases the previously mentioned symptoms become more severe. Complete stupor and coma are added, and at last death with moaning asphyxia closes the scene. In a great majority of cases death thus takes place in this so-called cold stage.

Fourth Stage.—The fourth stage, or *the stage of reaction.* The patient, after having continued in the stage of collapse for a shorter or longer period, now gives indications of recovery, but he is not yet quite out of danger, for complications may arise which would soon carry him away. Leaving such cases out

of consideration for the present, I shall take up a typically favorable case.

In some cases the recovery is as quick as the decline. The physiological secretions soon begin to be restored. The urine is secreted at first in small quantity, is highly colored, acid in reaction, and has a peculiar odor; albumen may or may not be present. There may be sediments present in the urine. The re-establishment of the excretion of urine is a very hopeful sign, and denotes the commencement of the stage of reaction. The vomiting and purging may still be present, but their frequency is very much diminished. The stools become thicker and may be of various colors, but are generally yellowish. The pulse becomes perceptible at the wrists, and regains its strength. The heart's sounds are audible in the precordial region, and assume their normal character. The temperature of the body, which has been below normal, begins to rise—no particular dependence should be placed on the rising of the temperature alone, as a prognostic sign, when other favorable indications are absent; for in almost all fatal cases the temperature shows a tendency to rise, up to a certain degree. The cramp, which has been so long troublesome, ceases at the beginning of this stage. The general appearance of the patient is quite changed, he looks lively; the blood is restored to all parts of the body, and the voice, which has been lost, regains its tone. The respiration becomes easier and regular. The patient still feels thirsty, but the appetite gradually returns; he is drowsy and sleeps off

and on. In some cases a mild type of febrile symptoms appear before the patient completely recovers. Occasionally some one symptom becomes very pronounced and troubles the patient as well as his physician. Vomiting, for one, may persist though all other symptoms have abated. This is due to the congestion of the gastro-intestinal mucous membrane, and is not dangerous unless gastritis supervenes. Hiccough, for another, often accompanies the vomiting, or the latter may subside and the hiccough then appear. There are some other disturbing symptoms, such as insomnia, which is often complained of by patients, slight pyraxia, dyspepsia, loss of appetite, flatulence, eructations, and feeling of weight in the stomach. The increase of temperature at the onset of the stage of reaction is supposed by some practitioners to be an indication of its commencement. I have heard practitioners, in talking to one another in cases of cholera, say that the patient is probably out of danger as he has got fever. The premonitory fever almost always promises a favorable termination unless complications occur.

IX. The Complications and Sequelæ occurring in the Course of Cholera.

The complications depend greatly on the length and severity of the stage of collapse, as well as on the previous condition of the patient. But in almost all cases there are some deviations from ordinary convalescence; but as long as they are mild they are not

much to be feared. Sometimes they assume graver forms and, consequently, require separate consideration.

Relapse.—Relapse after a fairly established reaction is not very common, but now and then cases of this kind may be met with. This is generally, I believe, brought about by the improper management of the stage of reaction. For instance, any ill-management of diet would quickly upset the digestive functions, which had not been thoroughly re-established, and thus there would be the symptoms of vomiting, purging, exhaustion, terminating in a comatose condition and ultimately in death.

Imperfect Reaction.—This should not be confounded with relapse, though very much similar to it. Many patients after passing through the stage of collapse become victims of this condition, which is fortunately not always fatal. Here the patient has passed through the most dangerous and critical stage, but the symptoms of recovery are very slow in their development; more or less purging and vomiting continue. The character of these evacuations has changed, but not sufficiently to remove apprehension; the temperature still remains below normal, pulse does not improve much; appetite is dull, tongue dry, and the patient does not grow daily stronger, but becomes more and more exhausted, and ultimately sinks, sometimes with the development of typhoid symptoms.

Typhoid State of Cholera.—This state is not peculiar to cholera, as it is met with in most other severe

acute diseases, such as typhus, typhoid, cerebral fevers, etc. The condition is produced by the circulation of a retained deleterious product in the blood. This material is carried into the brain, and other parts of the body as well, giving rise to symptoms common to this state. There is a rise of temperature of the body, the thermometer indicating that it has gone several degrees above normal; the pulse is very quick, weak, small, and compressible. There is general restlessness. The renal secretion apparently normal; nausea, vomiting, excessive thirst, dry mouth, low delirium, and soon after coma supervene. These cases may prove fatal at any time, so generally the prognosis is very bad.

Uræmia.—Very much allied to the previous condition are the symptoms of uræmia. This state of the blood is generally connected with some renal trouble, especially with Bright's disease; however, similar symptoms are to be seen in cases of cholera after the stage of collapse, in which the urinary secretion is embarrassed. There is some controversy as to the exact and direct causes of this state; however, I believe most authorities agree that the various symptoms of this stage are brought on by a chemical condition of the blood, which it subsequently undergoes by the accumulation of such material which would have been otherwise eliminated as urea and uric acid, but now retained in the blood owing to its non-elimination through the emunctories, and especially to the imperfect action of the kidneys, which play the principal part in the elimination.

The injudicious administration of large doses of opium and alcohol is said to have enhanced the development of the uræmic condition. The patient continues vomiting and purging. There are sensations of weight over the forehead, with vertigo and giddiness; the face becomes pale and livid; the pupils are dilated, disturbance of vision; drowsiness; ringing in the ears; sometimes deafness and confusion of ideas come on in quick succession, culminating in profound prostration and coma.

Ulceration of the Cornea.—This condition of the eyes requires certain considerations; of course it is common to some other chronic, debilitating diseases; so that even in cases of cholera the previous ill-health of the patient facilitates its growth. This is due to the imperfect circulation in the part, as well as improper nutrition. Both eyes may be equally affected, or one may suffer more than the other. There is disintegration of the epithelial cells, giving rise to small superficial ulcerations, which gradually get deeper and deeper according to the severity of the individual case. This ulceration is so marked that it is detectable with an ordinary lens. The corneal surface becomes opaque and the sight hazy. All these symptoms leave no trace whatever behind, unless in some bad cases, but pass quickly away with the recovery of the patient. The patient soon regains his normal sight, the cornea becomes transparent, and everything goes on normal. But in worse cases there may be permanent opacity present, or some other serious damage may result.

Certain Rarer Forms of Complications.—Certain rarer forms of complications may be occasionally met with, such as gangrene, bedsores, boils, ulcers, etc. Goodeve says that complete gangrene of penis and scrotum, and partial gangrene of the scrotum and of the point of the nose, are seen among the natives of Bengal. He also states that, besides these, cases of parotitis come under the observation of the practitioners. Both parotid glands may be equally affected, one after the other. The symptoms of such cases are like those of ordinary mumps—low fever, impaired appetite, and the mechanical interference with the swallowing of food. Deglutition is painful and difficult, though these symptoms in themselves are not very dangerous in ordinary cases; in some cases of cholera they are of very grave import, and often endanger the life of the patient. All these complications are more or less due to low vitality and impaired innervation.

I have observed cases of complications which may be put under this category, and which are brought on by the injudicious administration of drugs; for instance, there are cases to be seen in ordinary practice in Bengal of excessive salivation caused by the careless external use of some mercurial preparations. Cases of chronic diarrhœa and dyspepsia are also met with as the result of cholera.

Uterine Complication.—If pregnant women are attacked with cholera, as they often are, some escape the attack, others die undelivered, but in the great

majority of cases premature labor sets in, and the woman is delivered of a still-born child, generally in the collapse stage. These cases should always be considered as serious, the occurrence of cholera in the puerperal state being invariably fatal.

X. Diagnosis.

In the early stage cholera may be mistaken for acute irritant poisoning, especially the arsenical, for in this stage there are some symptoms common to each, such as nausea, vomiting, purging, abdominal pain, intense thirst, etc.; but this difficulty is soon after removed by the development of other symptoms, in which the diseases greatly differ. In cases of irritant poisoning the vomit and alvine discharges are usually tinged with blood, while in cases of cholera this never occurs, but the ejecta resemble rice-water. Besides, in cases of cholera, suppression of urine, profuse perspiration, shrivelling of the hands and feet, sunken eyes, cramps, and other symptoms are present. Epidemic outbreaks in the neighborhood also help the diagnosis; in lower Bengal, where the disease is endemic, this difficulty may be overcome by carefully watching the differential symptoms. There are one or two more diseases with which cholera may be confounded, such as bilious diarrhœa and choleraic diarrhœa. Though at the onset the symptoms of these diseases resemble cholera to a certain extent, they never become very severe unless, as in some cases, cholera may be devel-

oped from previously existing diarrhœa. One more distinctive point is that in such cases the stools always contain bile. But in all cases the patient should be carefully watched for some time.

XI. Prognosis.

The prognosis in cholera is almost always grave, and it depends on a variety of circumstances. The early part of an epidemic is more dangerous, and the number of deaths greater than at its decline. The mortality is less in its endemic area, and also varies in different epidemics. In some epidemics the percentage of deaths is as high as eighty, but generally varies between twenty-five and eighty per cent, according to the severity of the epidemic. The age of the patient must be considered too; as Mr. Grainger states that the liability to fatal attacks increases after the age of fifty in both sexes, the age from five to forty-nine having the lowest comparative mortality. But I do not quite agree with him, for it would be seen from daily practice in Bengal that the prognosis is bad when strongly-built persons in the prime of their lives are attacked; for in cases of robust persons the attack is far more severe, and they succumb more rapidly, while I have often seen weak, debilitated persons escape from an attack, though more predisposed to the malady than the former. The mortality is greater amongst the poor than the rich; the simple reason of this fact is that the former are usually exposed to bad hygienic condi-

tions, and also that circumstances do not admit of their obtaining proper treatment in the early stage of the disease, or until it is too late, when the chance of recovery is greatly diminished. Various other circumstances peculiar to, but over which they have very little or no control, enhance the rapid development of the virus, and consequently such cases terminate fatally. The previous intemperate habit makes the prognosis bad.

Now a few words regarding the severity of the disease depending upon the development of the different stages. In the cholerine stage the disease is not usually fatal; if the patient is properly treated, the disease goes no further, and the patient gradually recovers; but in most cases this stage is absent, and the disease commences at once at the second stage, quickly passing into the stage of collapse. In this second stage, if there is too great an exudation of serum and too persistent vomiting, the patient soon becomes exhausted, and the chance of passing into the next stage is greatly increased. While, on the other hand, if the second stage is prolonged and the symptoms are ill-developed, then there is little chance of the development of the next stage, and the patient, without going through the most dangerous stage, gradually recovers. The danger of the next stage is always very great, and this increases with the severity of the symptoms and unusual prolongation of the stage. The lividity of the surface; profuse cold, clammy perspiration; the disappearance of the brachial pulsations; undue interference with respiration; suppression of urinary secre-

tion, and the advent of typhoid symptoms, are always indications of fatal issue. Among some favorable indications, the gaining in strength of the radial pulse, quiet respiration, gradual return of circulation, tendency to sleepiness, gradual rise of temperature, and grayish, thick stools, with the cessation of other disturbing symptoms, may be reckoned as indications for a hopeful prognosis. With the establishment of the reaction stage the chances of recovery increase, though now and then cases end fatally even after almost complete disappearance of the dangerous symptoms. The complications of graver kind often lengthen the duration of the disease, and the prognosis becomes serious. Duration of cholera is very variable; some cases terminate within a few hours to two or three days.

XII. Morbid Anatomy.

As in cholera death may take place at any time in the course of the disease, so the post-mortem changes vary according to the advancement of the stages. But usually death takes place either in the stage of collapse or that of reaction, so it will be better to consider the post-mortem changes under two principal heads: first and most common in the collapse stage, and then in the stage of reaction.

When death takes place in the stage of collapse, the following phenomena will be usually met with if searched for shortly after death, for I have often noticed in the post-mortem room that the post-mortem

signs vary according to the time which has elapsed since death: The features are pinched and shrunken, and the body is moderately nourished, or sometimes emaciated, the rigor mortis is developed within a few minutes of death, first the back of the neck and lower jaw, muscles of the face, front of the neck, chest, and upper extremities, and then the lower extremities. So that when it is fully developed the forearm and legs are contracted on the arms and thighs; and in some cases the forearms are so contracted as to cross each other, assuming an attitude of prayer: which has been mentioned in old works as an attitude of prayer in last moment of life, while we know now this is certainly due to rigor mortis. The bluish or purplish discoloration due to the hypostatic congestion is to be noticed at the back of the neck, on the whole of the back of the body, and the posterior aspect of the thighs; in fact, all over the dependent parts. The skin of the fingers and toes presents a shrivelled-up appearance, as if they were soaked in water for a considerable time. This shrunken appearance gradually diminishes. The temperature, which begins to rise just at the close of life, continues to do so until it has risen two to four degrees above at the time of death: e.g., if the temperature of the body before death be 96° F., it would rise after death to 98° or 99° F. This fact might be attributed to the muscular movements which the muscles undergo just before and subsequent to death.

Head.—It is more or less congested; the scalp presents somewhat livid and pale appearance. The dura

mater is dark, and the vessels of the pia mater are loaded with dark blood. The brain-substance itself is more or less hyperæmic; nothing very special is to be noticed in the brain; the ventricles are generally empty. Thudichum asserts that the nerve-tubules and ganglionic cells of the gray matter become affected, "that the axis cylinder separate and the nerve-marrow curdles." The spinal cord on section appears, like the brain-substance, hyperæmic, and contains a large quantity of dark fluid.

The Thorax.—The heart and the lungs are the two principal organs that remarkably suffer in this region.

The Heart.—The right cavities of the heart, as well as the pulmonary artery and the vena cava, become distended with extraordinarily thick and dark blood. The left cavities are empty, or nearly so, compared to the right side, but not absolutely so, for the left auricle and ventricle and the pulmonary veins almost always contain a little blood.

The Lungs.—These are found very much in the state of collapse. On opening the thorax they are seen, instead of overlapping the heart, pressed backward and shrunken. They are lighter in weight, less crepitant, less spongy, and less tough than normal. On section the cut surfaces look pale grayish or pinkish gray, showing the anæmic condition of the pulmonary tissue; but if this cut be made at the root of the lungs there will be oozing out of blood from the vessels, staining the pulmonary tissue, which is at first dark and then soon after exhibits a hyperæmic ap-

pearance. So we should judge the condition of the lung-tissue at our first incision. Drs. Chakrabartty, Macnamara, and others have noticed the congested condition of the lungs in some exceptional cases of death from cholera. This state of lungs greatly depends on the time at which the post-mortem examination is made after death. If the examination is made after a number of hours (say six or seven), there is a tendency for blood-serum to exude into the surrounding parts, and thus to produce infiltration. So, in order to obtain an accurate knowledge of this state of the lungs, the examination must be performed within a short time after death.

Before passing on to the abdomen I should like to consider the state of the larynx, trachea, and bronchi. The mucous surface of this region assumes a pale and livid appearance. The epithelium of the nasal passages and mouth is destroyed, and consequently the cholera patient in the complete stage of collapse loses the power of taste and smell. The papillæ circumvallate of the tongue and the mucous papillæ of the pharynx and œsophagus are somewhat enlarged and stand prominently on the surface; their apices are distinguished by dark spots.

Abdomen.—The muscles of the abdomen become flabby, and there is distinct dark, purplish discoloration in them. On opening the abdomen the peritoneum is found injected with rosy pinkish coloration.

Stomach.—The stomach is very much contracted, and its normal mucous surface is somewhat congested

and covered with viscid mucus. Sometimes there is found medicine which has been given during life, but has neither been absorbed nor has it passed further. The glandular structures are usually swollen, and the shedding of the epithelium is not uncommon.

Intestines.—The discharges in the small and large intestines are different. The folds of the small intestine stand out prominently, and, on squeezing, a kind of fluid matter will be found to escape. In duodenum the glandular structures are very marked, while the rest of the mucous membrane is apparently hale and sound, either of red or of pinkish color, or is more commonly in patches of arborescent vascularity, alternate with dull white patches. The valvulæ conniventes are thick, œdematous, and doughy; the solitary and agminated glands are prominent, raised a few lines above the surface, and usually very marked. Peyer's patches are distended with a whitish material, and the mucous membrane is in some places ecchymosed, and in others denuded and rough-looking, owing to the shedding of the epithelium. The small intestine is distended with fluid similar to that evacuated during life, but this fluid is usually a little thicker, and if allowed to stand for a while it would divide into two portions, one thicker, which settles at the bottom, and the other a paler rose-water-looking fluid, which floats on the surface. Under the microscope this fluid is seen to contain epithelial cells, either quite separate and distinct or agglomerated into clusters, each little mass containing some twenty

or thirty epithelial corpuscles. Besides these there are spheroidal cells present in the fluid, showing the destruction of the glandular structure; the rest of the material consists mostly of serum or serous fluid, not unfrequently blood and blood-corpuscles, though occasionally bile also is present.

The large intestine is collapsed, especially the colon, which is extremely collapsed and shrunken, and contains almost nothing. The glandular structures of the intestine are opaque.

Mesenteric Glands.—The mesenteric glands, especially those connected with duodenum, are hyperæmic, and the gland-tissue soft and œdematous.

Liver.—The liver does not participate in any very remarkable change; occasionally there is a shrinking of the capsule, due to the draining away of the serous fluid from its substance. Incision shows the parenchyma to be pale, and there is evidence of venous congestion.

Gall-bladder.—The gall-bladder is full of bile, which is thick, inspissated, and of peculiar consistency, and very dark color.

Spleen.—The spleen is smaller than normal, and is somewhat dark in color, with shrinking of the capsule like the liver. There is nothing remarkable seen in the pancreas.

Kidneys.—As regards the kidneys, these organs are hyperæmic. The superficial veins exhibit stellate appearance all over the surface. Both cortical and pyramidal structures undergo venous congestion, the latter

more marked than the former. The tubules are filled with a fluid consisting of granular epithelium and débris.

Urinary Bladder.—The bladder is collapsed and empty. Its epithelial surface does not undergo any change except slight opacity.

In the Stage of Reaction.—Now we shall consider the morbid changes that take place when a patient dies in the stage of reaction. Even in cases of death in this stage there is a great variation from its commencement to its perfect establishment. So, if a patient dies just at the commencement of this stage, there is little or no difference in the post-mortem changes from those of death in collapse; but when the reaction is fairly established, the post-mortem appearances are greatly modified. The shrinking appearance of the general surface of the body disappears and the body becomes rather plump.

Head.—There is a slight venous congestion in the brain, as well as a slight effusion of its membranes.

Lungs.—No collapse of the lungs is to be met with in this stage, but on section the parenchyma of the lungs looks congested or hyperæmic. In rare instances the lungs suffer inflammatory changes, as pneumonia and consolidation.

Heart.—In the heart there is not much difference in both sides between this stage and that of collapse. Sometimes there may be present coagula on the left side.

Stomach.—The whole of the mucous membrane of

the stomach is vividly injected, and the glandular structure prominent. In parts there are denuded mucous surfaces in the state of repair. Pus may be present, as a considerable quantity of pus is often passed with the stool in this stages during the life of the patient. The presence of this fluid may be explained as due to a process of repair in parts of the mucous membrane of the alimentary tract.

Kidneys.—The kidneys in this stage are large and deeply ingested. On section, a large quantity of dark blood exudes in drops, showing the unusual congestion of the organ. The tubules are blocked up with a whitish material consisting of disintegrated shreds of epithelium and albumen. These shreds or epitheliums, oil-granules, and débris filling up the tubules give them an opaque appearance. These particles are to be often seen if the urine is examined when first passed by a patient during the stage of reaction. So, in fact, these organs very much resemble those of acute desquamative nephritis, the characteristics of which I need not enumerate here. The liver, spleen, pancreas, etc., assume their normal appearance and activity with great rapidity.

In accordance with the secondary complications, there may be present in the dead body ulcerations on the skin, gangrenous patches, suppurative glands, gangrenous lungs, etc. But these are by no means characteristics of cholera.

XIII. The Condition of the Blood and the Secretions in Cases of Cholera during Life.

Here I should like to consider the changes that the blood and the secretions undergo in cases of cholera. The blood undergoes considerable changes; and as regards the latter, they are more or less dependent upon the morbid changes of the blood. So I shall take up the consideration of the blood first.

Condition of Blood.—The blood in cholera has been carefully, both chemically and microscopically, examined by Drs. Parkes, Garrod, Schmidt, as well as by several others, and they are considered to be the best authority with respect to the chemical analyses of blood in this disease. The most prominent and remarkable phenomenon that is to be noticed is the separation of water and salts which takes place in the intestinal flux. As a result of this there is a retention in the blood of an excessive quantity of albumen and cells, with a considerable diminution of salts and fibrin; as regards the absolute diminution of the quantity of the latter, it is a dubious point, but its coagulability is greatly diminished without any doubt. These changes in the blood generally take place in the early stage of the disease. The watery constituent of the blood is affected first, and transudes before the solids. Amongst the salts there are differences in reference to their capability of diffusion. So some exude before the others. The chlorides transude before the phosphates, and the

salts of sodium before those of potassium. Soon after, an important change occurs in the blood-substance itself. The normal current of diffusion from the fluid of the blood to the corpuscles takes an inverse course; that is to say, the current, instead of passing from the fluid into the cells, now passes from the cells into the fluid, which is in a state of continued transudation through the intestinal mucous membrane. In this process of diffusion it obeys the same laws as in the case of intestinal flux. So the blood-globules soon lose their fluid and saline constituents. It has been observed by Dr. James M. Cowen in a rare instance, in a case of a woman who died of cholera, that the blood-disks, especially the white, had undergone a remarkable alteration. They generally assumed a circular shape, while a few of them were caudate with well-defined external border. When seen edgeways they were flattened, and were found to be in the extremely increased proportion of one to seven of the colored cells. It is doubtful whether these changes are to be noticed in all cases of cholera.

However, it is manifest that the character of the blood changes in proportion to the loss of its constituents. The density of the fluid increases, and the specific gravity is also higher than normal. While this transudation is going on in the intestinal canal, there is a diminution of the diffusion-currents from the blood to the various tissues, and at last, on account of the increased density of the blood, an inverse current establishes from the latter to the former, so that the volume

of the blood is increased by the additional moisture from the surrounding parts. In this way the fluids that are drawn from the vessels, viscera, and other parts are loaded with metamorphosed products from the tissues, which under ordinary circumstances would be quickly eliminated from the blood through their normal passages. This process of elimination is greatly in abeyance; there is continued accumulation of deleterious materials in the blood, and consequently the blood cannot properly perform its normal functions. It is well known that the blood-globules participate largely in the respiratory and heat-producing processes of the body; so their destruction and deterioration as well as the draining of the salts from the system in general cause the cyanotic appearance and lowered heat of the body. Dr. Parkes says: "Knowing the great share taken by the blood-globules in the respiratory and heat-producing processes, it is scarcely possible to avoid concluding that their loss of salts is connected with the characteristic cyanosis and lower temperature in cholera. In most cases there is vomiting and purging before there is loss of heat, though this very soon follows in a slight degree, and then gradually augments. In other words, the diarrhœa coincides with the first or early chemical changes in the blood—the transudation of some of the constituents of the serum. The lowered temperature follows afterwards, at the time when we know that diffusion from the blood-cells into the serum must be taking place, and augments gradually as the diffusion increases."

Sometimes peculiar substances like butyric acid and ammonia are found in the blood of cholera patients. Dr. Thudichum shows that this is due to an imbibition of the butyric acid from the intestines themselves. The color of blood sometimes is intensely dark, but capable of recovering its normal hue when exposed to the air. There is no chemical evidence of the presence in the blood of a special poison.

The Changes in Secretions.—We know in all processes of secretion blood plays an important part. So any abnormal condition of the blood puts the secretions in abeyance, and the secretory organs are unable to perform their proper functions: in cases of cholera, as we have seen, the blood suffers much, and so upsets the whole secretory system. I should commence the consideration of the changes of secretions with

Saliva.—This is very largely increased during the first stage of the disease, but when the disease has advanced a little further it is greatly diminished, and the patient experiences an unusual dryness of the mouth, and throughout the whole of the buccal cavity down to the throat there is a sensation of dryness, with constant desire for drink. This state lasts for a considerable time, in fact until the reaction sets in, when the salivary secretion again becomes normal. Chemically, it does not undergo any change, but it becomes a little thick and tenacious. In exceptional cases the salivary glands themselves are complicated, giving rise to abscesses or parotitis.

Intestinal Secretions.—It is very difficult to obtain

the secretions of the different internal organs separate, as they are usually mixed with the intestinal discharges. In the advance stage of the disease, the function of the secretory organs almost stands still; so we will take up the consideration of the evacuation itself.

Consideration of the Evacuation.—The quantity of fluid evacuated varies from eighty to one hundred and fifty ounces; the specific gravity seldom exceeds 1012; the reaction faintly alkaline or neutral. Parkes says that the liquid portion is not pure serum of blood, for it contains less albumen, but still it is serous in its nature. It consists principally of water with a considerable amount of salts and a small quantity of albumen. Traces of blood may be sometimes found. The salts are chlorides of sodium and potassium, and also phosphate, carbonate, and sulphate of soda in the proportion of seven or eight parts per thousand. The greatest loss from the blood is water; for every hundred ounces of the fluid abstracted nearly 98 or 99 oz. are water, and about one per cent salts. There is very great difference of opinion held by different authorities with respect to the microscopy of these evacuations.

First of all with respect to the flocculent material contained in the rice-water ejecta. Dr. Parke says that it is a modification of fibrin, while Dr. Gardner claims that it is "altered mucus." Those who hold the parasitic theory believe the flocculent material consists of altered epithelium in a state of degeneration, brought on by the morbid poison—the fungi. It is argued that any epithelium found after death is the

result of post-mortem laceration, and is not therefore a result of any vital phenomenon. Those who subscribe to the bacteria theory also say that the altered epithelium constitutes the flocculent material. It appears that these statements have been exaggerated, and much epithelium is due to post-mortem laceration, so that there are two views on the point: (1) greater portion of epithelium is the result of post-mortem laceration, or (2) due to mortification of parasite or bacteria; and the parasitic theory rests a good deal upon this. Haley in Germany went so far as to describe distinct organisms which he called "cystosporangia," and which he thought were invariably evacuated in the same way as Drs. Macnamara and Pacini thought the granular condition of epithelium was due to micrococci. Both these questions, What are these contents? and, How far are they connected with fungi? are elucidated by Drs. Lewis and Cunningham, who are the best authorities on the subject. Their investigation has led them to disbelieve the fungoid theory of the origin of stools. There is, they say, no specific cyst or sporangia to be found in the cholera stool.

With respect to the nature of the flocculent material, there is a good deal of epithelium, which is not caused by vibrionic or bacteroid change; but due to disintegration of epithelial cells in general by natural process of death, and the firmer constituents of it are fibrin and blood-plasma. This view has been held by Dr. Parke, and here I give his analysis of the discharge in a tabular form:

THE ANALYSIS OF THE DISCHARGE IN A TABULAR FORM.

PERIOD OF THE DISEASE IN WHICH THE STOOL WAS TAKEN.	Specific Gravity.	Albumen in 1000 Parts.	Extractine in 1000 Parts.	Sol. Salts in 1000 Parts.	Total Solids in 1000 Parts.
Diarrhœal period.....	1012.9	0.466	3.846	9.04	13.9
" "	.....	0.29	6.82	5.99	13.1
Early algide stage.....	1009.0	2.4	1.27	10.98	14.65
Developed and intenser algide stage....	1009.5	1.18	0.55	9.14	10.87
" " " " "	.....	2.18		7.52	9.7
Developed and moderate algide stage...	1008.3	.027	2.23	8.33	10.83
" " " " "	1005.8	3.2		5.827	8.947
Commencement of reaction.....	1014.0	20.84		6.34	27.8
" " "	1008.91	1.48	6.055	9.085	16.62
Relapse	1017.83	0.855	17.355		18.21
"	.....	not weighable	4.589	3.881	8.47

Bile.—The liver itself does not undergo any remarkable change, and the secretion of bile goes on normally during the early stage of the disease; but later on, when watery discharge comes from the intestinal canal, the blood loses most of its watery constituent and thus becomes thicker and thicker, and cannot easily pass through the small capillary blood-vessels of the liver. Besides, the blood, which in its normal state undertakes some share in the manufacturing of certain constituents of the bile, is now deprived of that activity. The hepatic cells continue their work under this anomaly, though their normal functions are very much diminished. The product of the activity of these cells accumulates in the gall-bladder. There is very little or no discharge of this secretion into the intestinal canal. As we all know, the acid contents of the stomach passing over the orifice of the biliary duct set forth a reflex action on the muscular wall of the gall-bladder and ducts, which contract and cause a profuse discharge of the bile from its reservoir. This normal process is arrested by the alkaline contents of the stomach and duodenum in cases of cholera. So, in cases which terminate fatally, the gall-bladder is found distended with this fluid, but in favorable cases, as soon as the reaction sets in, the bile immediately comes into play, as I have already noticed.

Urinary Secretion.—The kidneys suffer more than the liver. The veins of the papillæ become congested and the epithelial cells slightly alter their shapes. In the early stages there is not much alteration to be

noticed in the urine, except that it becomes less and less in quantity; but in fully developed cases of cholera the secretion of urine is entirely stopped. This is due to the diminishing watery constituent of the blood itself, which is drained away with the intestinal flux, and also to the diminished general blood-pressure, which is evident in the slow action of the heart. So this organ is deprived of its normal activity for several hours; and sometimes it is so long that if nature had not otherwise provided for the elimination of the effete matter that should have passed through this organ in its normal state, the case would have ended shortly in coma and death. But during the inactivity of the kidneys the fatal termination, with the development of uræmic symptoms, is delayed by the excretion of the effete matter through the mucous surface of the stomach and intestines. Now, if the patient survives this stage the function of this organ is restored gradually. The excretion of urine comes on slowly, and later than the other secretions. When it is first discharged after this stage, it is found to be small in quantity, high-colored, acid in reaction, and has a peculiar odor, almost always containing albumen and epithelial cells.

XIV. Treatment.

The treatment of cholera may be considered principally under two heads: first, the preventive treatment; and secondly, the curative, under which come all kinds of treatment, hygienic, medicinal, and dietetic.

PREVENTIVE TREATMENT.—This is an important matter during cholera epidemic, and first calls our attention. All the hygienic principles should be strictly carried out. It is impossible to describe in detail all the hygienic principles in a small work like this, but I shall just enumerate a few:

1. *Cleanliness* must be observed as particularly as possible in its every minute detail. 2. *Free ventilation.* For this purpose the windows should be kept open so that there may be free communication betwen the internal and external air. This must be especially observed in cases of poor people who live generally in close and ill-ventilated rooms. 3. Too much *overcrowding* must be avoided. 4. *Disinfectants* should be freely used in and around houses, especially in places where there is accumulation of filthy matter. 5. The *water-supply* must always be pure; the drinking-water should be thoroughly filtered. 6. House-drains, street-drains, sewers, water-closets, privies and ditches, etc., should be examined carefully over and over to see that they are in proper order. 7. The practice of quarantine during cholera epidemic is a good plan, though we are quite ignorant of the nature of the poison and its mode of operation. But it has been seen during various epidemics that the poison has been carried from one place to another by intercommunication. It has been also found during different epidemics that quarantine stops short the spread of the disease. 8. The most important point is to attend to the evacuations from the bowels, and ejecta from the mouth, of the cholera patient,

which are generally supposed to be the bed of cholera poison. These are carried generally through the body-clothes or bed-clothes of the patient, or through the fometis of the attendants. The walls, floors, and the furniture of apartments often get soiled with these evacuations, which, if no proper means be taken for their disinfection, would generate fresh cases of cholera. The urinals, bedpans, and the spitting-pots are required to be thoroughly disinfected before they are used. The evacuations themselves should also be carefully disinfected before they are thrown away. These should not be thrown into the water-closets or privies, but they should be buried a considerable depth underground, in such a place where they cannot be communicated to any pool or water stream, of course being previously mixed with disinfectant fluid. For the disinfectant purpose, chloride of lime and water, or carbolic acid, or Condy's fluid may be used. The soiled clothes can be disinfected by being soaked in the disinfecting solution, or if they are of linen or other washable material they can be boiled after having been soaked in Condy's fluid or carbolic acid solution. This process of disinfecting gives complete immunity, so I do not think it advisable that these things should be burned as many recommend. Those substances that cannot be boiled but can stand being baked may be submitted to a temperature above 212°F. The floor, paint, furniture, and all suspected articles must be washed with chlorine water or with acidulated solution before they are used. The acid has a great dis-

infecting power as regards cholera poison. The poison whenever it comes in contact with acids, either in the water or soil, or acid gases in the atmosphere, is destroyed. Thus nature has a destructive agent. So in the human economy also there is a natural preventive, the acid secretion of the stomach. This fluid when sufficiently secreted acts to a certain extent as a preventive against cholera. Acid drinks during cholera epidemic may be recommended as a prophylactic; for this purpose sulphuric-acid lemonade may be used. The prophylactic power of acid has been proved on several occasions. When the disease breaks out in a small confined area, such as on board a vessel, etc., the preventive effect of acid is well seen.

With regard to the disposal of corpses, they should be burned, as with some nations who follow the custom of cremation; and with those who think this a cruel custom, or who are prejudiced against it, the corpse should be buried as soon as possible. The coffin should be thoroughly disinfected either with lime, charcoal, or carbolic acid.

The burning of sulphur as a prophylactic measure has been strongly advocated by Dr. J. E. Tuson, who has written a paper on the subject and has cited numerous instances to show its marvellous effect in the prevention of cholera epidemics. I think the burning of sulphur in the production of sulphurous acid would undoubtedly act as a disinfectant and antiseptic. Due to the antiseptic property of sulphurous acid, it has been introduced in the modern antiseptic surgery, and

is used by many surgeons. It prevents the fermentation, and consequently stops any further proliferation of the materies morbi.

Now a few words to my Indian readers, who are aware of the fact that it is customary in greater part of India to burn resin or sometimes sulphur every evening. This mode, though gradually dying out, is strictly observed by lower class of people and the shopkeepers as one of several other superstitions. I am glad to say it has been based upon purely scientific principles; but unfortunately most of the people, not knowing its scientific operation, follow it as a custom, and consequently they burn so sparingly, sometimes only a few grains, so that little or no effect is produced. But I must admire the principle, and it is doubtless one of the most handy and simple means of disinfecting close and ill-ventilated rooms. What I wish to impress on my readers is that its object is that of disinfecting the atmosphere, and should not be blindly used as in Bengal as customary. I think during cholera epidemic, if we all follow that custom which is prevalent in Bengal, and burn a considerable quantity of sulphur every evening in every house, we can without much trouble or expense secure an atmosphere sufficient to destroy the cholera germs or poisons, if they be floating in the air.

The room of a cholera patient may be disinfected by some volatile disinfectants; or Condy's fluid may be atomized (reduced into minute particles) by means of spray-producers. I think the best and the most

convenient way is to keep the room filled with carbolic-acid fumes or sulphur fumes for some hours, the windows and doors being closed. After its thorough fumigation, the windows must be thrown open for some time.

A heavy rainfall may stop a cholera epidemic, or at least has great influence in diminishing the mortality. Similarly a thunder-storm or a great fire in the epidemic area will greatly mitigate its turbulent character, if not complete stoppage.

Now, before I leave this subject, I shall say just a few words as to the individual precautions during cholera epidemic. 1. All sorts of exposure should be carefully avoided, such as exposure to cold, to damp, or to rain; wearing wet socks and boots also to be avoided. 2. The body must be kept clean and moderately warm. 3. Late hours should be avoided. 4. Habits must be regular. 5. Food should be simple, nutritious and easily digestible, and that to which one is quite accustomed. Too richly cooked dishes, or oleaginous substances which are hard to digest, should, if required, be taken in great moderation. The substances that previous experience has shown intolerable to one must on no account be taken. All that I have stated under the heading of Exciting Causes must be guarded against, especially intemperate habit, eating putrid animal matter and unripe fruits, etc.

The hypochondriac tendency and the melancholy mood should be suppressed as much as possible, for it is very likely that this vital depression would act as a

predisposing cause, giving rise to cholera, or it might give rise to several other phenomena in the body which would act as the predisposing or exciting causes. Any purgative medicine should, if used at all, be carefully taken; in fact, no purging would be advisable except in unavoidable cases, when mild purging or enema might be administered.

THE CURATIVE TREATMENT.—As we have seen, there have been various morbid phenomena brought forward by different authorities as the true and immediate causes of the disease; and with these the rationale of treatment in cases of cholera greatly differs. This will be evident if we refer to the treatment of Dr. Johnson, who, being thoroughly convinced that the poisoning of the blood is the immediate cause of the disease, treated his cases on eliminative principle by means of purgative drugs, such as castor-oil and the like. There is no doubt he treats his cases with a great success. I presume this may be explained on the supposition that during the diarrhœal stage the purgative medicines would greatly increase the chance of recovery of the patient, if there are irritative substances in the stomach or intestinal canal that have been the proximate cause of setting up the evacuations. And again in the reaction stage, purgative medicines are now and then useful to carry through this stage quietly. I do not think this class of medicine is of any use in any other stage of the disease; even in cases where there is no trace of irritative matter in the intestinal canal, the astringent medicines will act far better than the purga-

tives; so in the use of purgatives even in the diarrhœal, stage we must exercise our discretion.

Venesection.—Venesection as a remedial agent in cases of cholera, especially in the stage of collapse, has been advocated and practised by many physicians. In 1828, twenty patients were admitted into the cholera hospital of her Majesty's 20th Regiment in India, and were bled, of whom seventeen died. This evidently shows that this is not a method of treating cholera patients to which we can give any importance whatever; fortunately however, this mode of treatment has been universally abandoned, and is not followed even by its most zealous supporters.

Charcoal.—The administration of small or large doses of charcoal has been practised by many on the supposition that charcoal acts as an antidote to cholera poison. I doubt very much as regards its antidotal property, but in some cases of cholera in early diarrhœal stage it may be administered with good result. It must be remembered that the action of charcoal is more mechanical than chemical.

Transfusion or Injection.—As there is no doubt that the blood in cholera patients becomes extremely thick, so much so that it can hardly circulate through the blood-vessels, and in most cases death takes place owing to this condition of blood, some ingenious practitioners have tried to replace the watery constituents of the blood by injection into the veins of a certain quantity of saline solution or serum. The immediate effect of this injection is no doubt to add

to the liquidity of the blood, and consequently the patient, who has previously appeared shrivelled and shrunken owing to the draining away of an unusual quantity of the serum of the body, now looks much more animated. But on the whole this does not prove a successful way of treatment in cases of cholera. There is a great drawback in such operation, which in fact compels us to abandon it completely. The propelling force of the injected fluid allows the deleterious product of the blood which has been already collected in the fluid, not having been eliminated by the excretory organs, now to circulate more freely in different parts of the body, giving rise to most distressing symptoms; for instance, when it reaches the brain there is apoplectic seizure, terminating in death.

Allopathic Treatment.—I shall take up a typical case of cholera, and state in a few words the plan of treatment usually adopted by allopathic physicians in the different stages of the disease.

During the first stage very little or no treatment is required; but if there be diarrhœa present, it may be treated as a simple ordinary case of diarrhœa.

During the first and second stage the internal administration of sulphuric acid in fifteen-minim doses has been strongly recommended by Dr. Macnamara. The combination of sulphuric acid and nitric acid has considerable success in early or choleraic stage of the disease. These drugs act as astringents, refrigerants, diuretics, and lastly as tonics.

One precaution should, however, be taken in the

administration of this acid, that it should not be given in too large doses, as there are chances of giving rise to other unpleasant symptoms, for when given in too large doses it is apt to irritate the gastro-intestinal canal.

It is very highly recommended in cases of cholera. During the epidemic in 1873, the deaths in cases which were treated with this acid amounted to eight per cent, while in cases where other remedies were used the percentage of deaths oscillated between twenty-three and forty-nine per cent. In the evacuation stage there are two principal methods of treatment: one by means of purgatives, such as sulphate of magnesia, calomel, castor-oil, etc.; and the other the astringents. The latter is now principally followed by physicians. Opium in full doses is a great remedy for this purpose, either in the form of pill, tincture, or powder; other astringents, such as acetate of lead, tannin, and gallic acid, are given in various proportions.

Collapse.—During this stage nothing but stimulants, such as ether, ammonia, and alcohol, etc., are given. They are pushed in some cases to such an extent that if there is chance of rapid reaction, this is delayed by the injudicious administration of alcohol and other stimulants during this stage. I shall state presently how this takes place. When a dose of alcoholic stimulant is prescribed for a cholera patient in cold stage, it does not act; its action is almost *nil*, now, as this mode of treatment is continued, and repeated doses of stimulants are given to wake up the

patient. But, as I have said, its action is almost *nil*, whatever quantity one may use; for the absorbing surface has lost the power of absorption, and thus the stimulant, instead of being absorbed, partly drains away, though very little, and the rest is left in the stomach and intestines. When reaction commences and the absorbing surface regains its power, the bad effect of excessive stimulants begins. The accumulated stimulants are now absorbed into the system and give rise to troublesome symptoms. So indiscriminate use of stimulant, especially the alcoholic, in cases of cholera must be carefully avoided. I can suggest, that in cases where alcoholic stimulants are used, if the physicians after a dose or two find neither the pulse nor the temperature is increasing, it is pretty certain that this medicine given internally will not act; it is not because the stimulants have lost their stimulating power, but simply because, as I have said, the absorbing surface of the stomach and intestines has lost the power of absorption; so this is a good indication for immediate stoppage of such stimulants. If the physician still wants to administer stimulant he might try some other way, but always bearing in mind that the injudicious exhibition of stimulant not only produces a bad effect in this stage, but also in the next stage, for which he only is to blame.

When there are pain and cramps, etc., some local measures are taken, such as sinapism, hypodermic injection of morphia, inhalation of small quantity of chloroform, but mainly friction, simple or medicated

with turpentine or chloroform liniment. In some cases cold water or ice may be applied.

Reaction Stage.—Tonics, such as iron, etc. Complications must be treated as they arise.

The following prescriptions will give a general idea of the treatment that was adopted in cases of cholera by different physicians during the epidemic of 1873 in America. The average percentage of death was between 23 to 49.

Prescriptions.—1. Chloral hydrate exhibited a most satisfactory result in arresting the vomiting and purging in cases of cholera, and also in inducing sleep with complete convalescence.

2. Mercury, opium and astringents, bromide and chlorate of potash, ammonia, chloroform, carbolic acid, dry heat. During the convalescence mercury and opium in alternate doses.

3. Dry heat at the extremities, ice-bag at the spine. Iced water *ad libitum*, and small doses of calomel. Now and again hypodermic injection of opium. (Dr. S. Allen. This physician treated a case of pregnant woman with good result and without miscarriage.)

4. Morphia, calomel, and iced water.

5. Morphia, capsicum, calomel internally; atropia, and quinine hypodermically.

6. Opiates, astringents, and mercurials in the early stage. In some cases diluted sulphuric acid and tincture of opium.

7. Mercurials, opiates, astringents, and stimulants.

8. Chloral hydrate was used with most satisfactory results, especially in cases of collapse.

9. Calomel, opium, and camphor in combination; chloroform and chloral hydrate as stimulant.

10. Quini sulph., tincture ferri chloride, tincture opii, and brandy gave satisfactory result.

11. ℞ Acidum sulphuricum..... 3 ss
Morphia sulphas..... gr. $\frac{1}{8}$
Spt. vini gallici..... 3 iss
Aqua dist..... 3 iij

The above solution was injected under the skin of the arms, legs, and over the stomach every hour until the symptoms were relieved. This has been done where there were all the prominent symptoms of cholera present.

12. Internally, calomel, opium, capsicum, with stimulants. Externally, sinapisms, frictions, and heat.

13. Calomel and opium in alternate doses, say in two of the former to one of the latter, repeated every hour for several hours. In conjunction with this, use the following:

℞ Ext. cannabis indica.....gr. xvi
Gum camphor..... 3 ss
Chloroform..... ℥ ss
Mucilage acacia,
Syrup simplex.....āā ℥ ss
Aqua cinnamoni..... ℥ i

A spoonful every one or two hours.

14. Creosote has been given with great success in cold stage of cholera.

℞ Creosote..... gtt. j
Aqua camphora,
Infus. gentian can.....āā 3 vi

One dose, and repeated every two hours.

Dr. J. T. Jones also relies upon calomel, camphor, creosote, and ice in the treatment of cholera.

15. Thirty or forty drops of laudanum, two grains of calomel, with one grain of camphor in early stages, and in collapse stage iced water and stimulant in large and repeated doses.

16. Calomel and camphor in sufficient doses internally; morphia hypodermically, often to be repeated. Dry heat to surface of the body and extremities.

17. In three collapsed cases of cholera, the uses of calomel freely, and creosote and plumbi acet., were found of value as affecting the vomiting and purging; chloroform was useful for cramps; opium, bismuth, tannin, and sulphuric acid were freely used.

18. Dr. D. O. Palin obtained good results from the use of veratria and dilute phosphoric acid. In acute stage the exhibition of calomel and opium were efficacious.

I can add numerous such prescriptions, but I think what I have given is enough to show the general plan of treatment adopted by the allopathic school.

Here is a table showing the comparative view of the

various modes of treatment in cases of cholera in Europe in 1832 and 1849:

Mode of Treatment.	Deaths.
Tartar emetic	19 per cent.
Salts and water	20 "
Cold water and ice	30 "
Ipecacuanha	57 "
Average	31 per cent.
Calomel and opium	57 per cent.
Opium alone	58 "
Bleeding, calomel and opium	59 "
Calomel alone	62 "
Stimulant	66 "
Bleeding alone	85 "
Injection into the veins	90 "
Average	70 per cent.

Homœopathic Treatment.—*Comparative View of Homœopathic and Allopathic Treatments.*—Now I shall take up for consideration the treatment of cholera by the new system of medicine; I mean the homœopathic, that has gained so much reputation in the treatment of such cases. Cases of cholera have been treated homœopathically during the different epidemics with extremely satisfactory results. The comparative success of homœopathic and allopathic methods of treatment in cases of cholera will be greatly in favor of the former. This will be evident if we look back to the statistical account of the homœopathic treatment in cases of cholera. I should not like to go in detail into the discussion of this matter, as it would involve a great

controversy. I shall just state the fact, that on minute examination of the statistics, it will be observed that the death per cent in cases of homœopathic treatment varies in different epidemics. In some the death per cent was very low, such as five or six per cent, though there are a few instances on record in which the treatment was so successful that there was not a single death; in others about eight or ten per cent, while others again fifteen per cent, though one authority states that the death rate in one epidemic was as high as thirty-nine per cent. Fifteen per cent is generally supposed to be the highest percentage of mortality under homœopathic treatment. Even if we compare this highest with the average death-rate under allopathic treatment, we shall see that in every hundred we save about fifteen lives; so if we consider for a moment the enormous number of deaths that take place in each cholera epidemic, we shall find we can save thousands and thousands of lives more if we follow the homœopathic mode of treatment. If this method of treatment be carried out from the very beginning of a case, the result is almost always favorable. I presume to say that under the strict homœopathic treatment cholera epidemic would not be a matter of horror, and the average percentage of mortality would not exceed any other epidemic disease. But there will be this much difference, the fear and dread of cholera might be just the same owing to the nature and rapidity of its fatal termination, and also it attacks large numbers of people and spreads very fast. But

on the whole it will be found that the percentage death-rate will be considerably lessened and will not exceed other epidemic diseases. By this I do not mean to say that cholera epidemic is no longer as dangerous because homœopathic treatment will cure cholera; for as a rule epidemics themselves are serious and dangerous and must be always apprehended. Such will be the case with cholera, and no less under the new system of treatment. Now this treatment, as I have mentioned, if followed from the very commencement almost always produces a most extraordinary result; at the same time neither the patient nor the attendants suffer so much from the development of distressing symptoms, for they so smoothly subside by the internal administration of drugs in homœopathic principle, which on the contrary would not respond at all to all the exertion of the attendants and the administration of the whole host of drugs of allopathic materia medica.

For instance, when cramps break out simultaneously at dozen different parts of the body, we require half a dozen attendants to apply friction, or sometimes blister, which adds additional trouble to the patient. But under the new system of medicine we can do away with this; in fact, no local application is required in the treatment of cholera. Without any further introduction, I shall at once commence the consideration of the treatment. But before doing so I want to say a few words as regards the room in which our patient should be placed.

Selection of a Room.—The room for the patient

should be as much isolated as possible from the rest of the house. It should have windows for the free communication of fresh air from outside, and if practicable a second room near the former would do well for the attendants and unavoidable visitors. This saves unnecessary overcrowding around the bed of the patient, and also gossips and whispers of some kind or other. In the room there should not be more things than are absolutely necessary; the carpets should be taken up, and also there should not be such things that cannot be easily disinfected if soiled with the evacuations. The temperature of the room must be moderately warm; for this purpose in case of cold climate artificial means must be adopted; steam would answer best, but as this is not a plan that every one can afford, I think ordinary fire would serve our purpose. It must be remembered that the temperature of the room should not be allowed to go down very low, neither too high. In cases of torrid zone I do not think they would require any fire to heat their rooms, which are themselves sufficiently warm to answer our object; but in exceptional cases of severe winter, and in some places, though they geographically belong to that zone, in fact their nature-position, and other circumstances have made them equally cold to the frigid zone. In such places we would require artificial means to heat our rooms. Now, one single bed should be placed in the middle of the room for free ventilation and ready access on all sides, and the bed must be guarded by water-proof. All discharges should be received in some vessel, either

chamber-pots or bedpans, etc., and these basins should contain some disinfectant substances. I think carbolic acid or powder, chloride or sulphate of zinc, chloride of lime or Condy's fluid will do nicely. If they contain some such material before the stools are passed, this deodorizes the discharge before it is diffused, and also it is thoroughly mixed up with the disinfectant. Nurses and other attendants should frequently cleanse their hands with disinfectant fluid, and they should be particularly careful not to take any food without first carefully washing their hands. Sulphur may be burned in the room, but with some it is very unpleasant.

Prophylactic Treatment: Medicinal.—I have already spoken of the preventive treatment, but now a few words as to the medicinal prophylactic.

Dr. Rubini says that during cholera epidemic three or four drops of the saturated tincture of camphor three times daily will act as a prophylactic. Smelling of camphor is supposed to act as a prophylactic.

Dr. Raue says: "The best prophylactic is no doubt sulphur, as recommended by Dr. Hering in his 'Domestic Physician.'"

First or sixth centesimal may be used for this purpose twice daily, in the morning and evening.

Dr. Richard Epp says that the prophylactic homœopathic remedies chiefly employed are cuprum and veratrum album. They should be taken alternately during cholera epidemic, one each day; a drop of the tincture in a tablespoonful of cold boiled water every

morning and evening. Cuprum as a prophylactic has been recommended by many others.

Treatment.—During the cholera epidemic slight indisposition or tendency towards diarrhœa should be carefully noticed, and also proper means should be taken from the very commencement, without waiting to see what course it takes. The following drugs may be more or less used in cases of cholera:

Ammonia, causticum, argentum nitricum, arsenicum, asarum europæum, belladonna, camphor, conium, cantharis, carbo vegetabilis, cuprum, hyoscyamus, ipecacuanha, mercurius, nux vomica, opium, phosphoricum, acidum phosphoricum, acidum hydrocyanicum, acidum nitricum, acidum sulphuricum, plumbum aceticum, rhus toxicodendron, secale, stramonium, sulphur, tartarus emeticus, croton tiglium, elaterium, pulsatilla, lachesis, terebinthina, china, naja, jatropha, tabacum, ignatia, cicuta virosa, agnus castus, etc.

The remedies that are used in the first stage, or, as it is sometimes called, choleraic diarrhœa, or cholerine, are not many; in fact, for the treatment of cholera not many drugs are used. The patient should be put to bed at the very beginning, and be treated according to the indications.

Camphor is supposed to be the best medicine in the early stage of cholera. Hahnemann strongly recommends the remedy, and it has been tried by several physicians in cases of cholera with great success. Dr. Drysdale of Liverpool and Dr. Russell of

Edinburgh had great chances of trying this remedy in innumerable cases of cholera, especially in its early stage. Dr. Rubini of Naples and his colleagues treated five hundred and ninety-two cases of cholera during an epidemic with camphor alone, without a single death. So its marvellous effect in cases of cholera is undeniable and is admitted by both schools. Drs. Ringer and Wood, of the allopathic school, also recommend it in cases of cholera. Dr. Ringer says: "Few if any remedies are comparable to camphor in summer diarrhœa and cholera. Its benign influence in cholera is most conspicuous; for it generally checks the vomiting and diarrhœa immediately, prevents cramp, and restores warmth to the extremities. It must be given at the very commencement and repeated frequently, otherwise it is useless. Four to six drops of strong spirits of camphor must be given every ten minutes till the symptoms abate, and hourly afterwards."

Prof. T. F. Allen and others recommend the administration of this drug, especially in cold stage of the disease. I believe this remedy can be freely administered in the early as well as in collapse stages with great advantage, according to the circumstances of the cases. Now let us see what are the indications under which we may administer the drug in both stages.

Indications for the Use of Camphor in the Early Stage.—Anxiety, restlessness, vertigo followed by nausea, headache, and heaviness of head; head hot, face red, with warmth of body; burning thirst, and

drinks large quantity without relief; nausea, vomiting, gulping up the contents of the stomach; vomit bilious, mostly sour and watery; sensation of heat in the stomach; pain in the pit of the stomach, with fulness of the abdomen; stool loose, with colicky pain or cutting pain; urine scanty; pulse quick and weak; sensation of dryness all over the body.

Indications for the Use of Camphor in Cold or Collapse Stage.—Delirium; loss of memory; a sense of coldness all over the head; eyes fixed, staring, turned upwards and outwards; or eyes closed at first, and later on staring, looking upwards; pupils contracted, immovable; lachrymation; face wild, staring; unconscious look; pale, livid, cold sweat over the face, with vomiting; pinched, deathly, and shrunken; absence of nausea or vomiting; body icy cold; coldness in the stomach, great prostration; absence of discharge; retention of urine; voice hoarse, husky; breathing difficult, suffocating; oppression; cold face, limbs, and body; pulse not perceptible; diminished flow of blood in those parts away from the heart, with death-like paleness of the face.

Administration of Camphor.—Dr. Rubini's tincture of camphor is nine times as strong as the one in ordinary use, and twice as strong as that used by the homœopathists. He gives four drops or even more—five to twenty drops—every five minutes, according to the severity of the case. I believe four or five drops for an adult every five minutes or so, in a small

quantity of white sugar or on the tongue, should be given in early stage. In ordinary cases free perspiration breaks out in two to four hours, and cure is the result. However, if these early symptoms do not abate by its thus administration, we should rest assured it is not going to act, and we must resort to some other drugs. In cold stage the dose must be very much less and at longer interval. In cases of children drop doses will be enough, of course at the same interval.

Before passing to the next stage, I shall just mention a few other remedies that may be indicated in this stage.

Asarum Europæum.—This may be given in the very early stage of the disease when there is stupid feeling in the head; dull headache; dryness of the throat; continuous nausea and inclination to vomit; vomiting only a small quantity of greenish somewhat sour fluid; empty eructation; a sense of pressure in the stomach, rumbling and gargling in the abdomen, with violent colicky pain and sometimes vomiting; stools semi-fluid, whitish gray, and not many in number. Pulse quick, breathing short; great lassitude; restless sleep; sometimes alternate feeling of burning and coldness.

Dose: A drop of mother-tincture or 3d or 6th decimal in a wineglassful of water; two teaspoonfuls should be given every two or three hours, according to the urgency of the case.

Pulsatilla.—This remedy may be indicated especially in the early stage, when the disease is brought on by eating fatty or oily substances too much. Bitter

taste in the mouth or diminished taste for every kind of food; nausea; inclination to vomit; thirst, dry mouth and throat; a very little fluid causes inclination to vomit, especially at evening or night; loss of appetite; acid eructation, or sometimes putrid; pain at the pit of the stomach; this pain sometimes passes along the right hypochondriac region; colicky pain in the abdomen, increased by motion; rumbling of epigastrium; stool watery, greenish and slimy, offensive; pulse accelerated, small and weak; vertigo especially when sitting; vertigo when stooping; sensation of heat in the head, and paleness of the face.

Dose: Pulsatilla 6th, two to four drops or half a dozen pilules in a wineglassful of water; two teaspoonfuls every two hours or hourly.

Phosphorus.—This will be indicated when the disease is ushered in by fatigue or exhaustion, such as comes from debauchery or licentious habit or too much sexual indulgence. Depressed spirits, fearfulness as if he is going to die; irritability of temper; easily excited; vertigo, worse in the morning; heaviness in the head; nausea; vomiting, worse in the morning; headache; noises in the ears; eyes sunken, with blue ring around; face pale and yellowish; lips, mouth, and throat dry; tongue tastes bitter, slimy, and dry; thirst, and wants cold drinks; regurgitation of food, with nausea; sourish, offensive, large quantity of watery fluid ejected into the mouth; constant nausea; vomiting of bile; heaviness in the stomach; burning pain in the stomach; loss of appetite; inextinguishable thirst, not relieved by drink,

rather gets worse; cramps in the stomach radiating over the liver; stools profuse, watery, and pouring as if from a hydrant, light-colored or greenish, with small white particles or sometimes undigested food; much thirst for water, this increasing during the night; there is little or no pain in passing stool; urine gradually gets scanty and pale, turbid; heart's action is accelerated, small, weak, and frequent.

Phosphoric Acid will do as well under same circumstances as have been stated above. This will do nicely when the patient is stronger built.

Dose: Both phosphorus and phosphoric acid like pulsatilla.

Euphorb. Cor.—This remedy may be indicated in some cases in this stage, especially when the vomited matter comes out with great force and the stools passed are like shot, and watery. There is troublesome feeling at the pit of the stomach, occasionally sinking, painful spasms of the intestines; faintness not uncommon: pulse slow and weak; painful cramps of the hands and feet; coldness of the extremities, as well as all over the body; cold perspiration covers the whole body, and the patient feels weak as a rat, with death-like sensation and great anxiety.

Dose like pulsatilla.

Iris Versicolor.—This is a very good remedy in early stage of cholera. Dr. Hale and others speak highly of it. Dr. Hale says: "In cholera morbus I have succeeded in every case in which I have administered it, even the most violent. A single teaspoonful

of a few drops in half a tumbler of water, has in many severe cases put an immediate stop to the vomiting. I consider it a specific in this form of disease, and I would earnestly request physicians to try it in the first cases of cholera asiatica which may fall under their notice, and give the result to the profession. In cholera morbis it arrests the pain which is so violent in many cases at the pit of the stomach, or around the navel, or, in some cases, still lower down in the abdominal region, at or before every fit of vomiting or purging. In fact it seems, as far as I have as yet been able to judge, the more appropriate the more violent the pain, and in some cases acting, as the patients and bystanders express themselves, 'like a charm.'"

English homœopathists have found iris very useful in cholera morbus, and even in true cholera. The special indications for its use are great burning distress in epigastrium; it comes on every few minutes, and is so severe that the patient can hardly endure it; shocks of pain in the umbilical region up to the epigastrium, with nausea and belching of wind; colicky pains about the navel before each spell of vomiting and purging; thin, watery, copious discharges from the bowels, in a continuous stream; and white tongue, severe headache, slight fever, hot sweat, and sense of despondency.

Dose: A few drops (three or four) of the 1st or 3d in half a tumbler of water; two teaspoonfuls every fifteen minutes or half hour, or still longer interval, according to the urgency.

Aloes, bryonia, nux vomica, colocynth, podophyllum,

ipecacuanha, and mercurius may be indicated in some instances.

Now we pass on to the second stage, or the stage of evacuation or development.

Cuprum.—When there are cramps and vomiting, with all the other severe and troublesome symptoms of this stage, present, one of the best remedies is cuprum. It unquestionably subsides the painful cramps, also exercises a great influence in arresting the vomiting. It is especially efficacious just at the onset of the collapse stage.

Hahnemann considers this as the specific remedy for the "second stage of the clonic spasmodic character," and it has the power of cutting short the disease when camphor has failed. Drs. Russell and Drysdale speak very highly of it. They have found ample instances where it acted satisfactorily. In 1866, Mr. Proctor, who treated ninety-eight fully developed cases of cholera with this drug, found it answered fully well for cramps, though he lost fourteen out of ninety-eight cases. He writes: "For the cramps it was unquestionably the best remedy, and I may say for the vomiting also. In the stage of collapse I gradually found myself trusting to cuprum, and the impression is very strong on my mind that in collapse it is the most reliable of our remedies."

Dr. Jousset gave it in the 12th dilution, and knew not a single failure, in cases of cramps of the calves.

The indications for its use will be the development

of the following symptoms more or less pronounced: Great prostration with nervous excitability; constant restlessness; great weakness of muscles; clonic spasms, beginning in the fingers and toes; spasms and cramps in the calves; drawing and dragging pain in the calf; cramps in the abdomen; violent spasms in the abdomen and upper and lower limbs, with keen distressing screams; stiffness of the whole body; icy coldness of the feet and hands; special senses become less acute; eyes dim, lustreless, sunken, with blue ring around; sense of hearing also diminished; voice powerless, talking difficult; breathing quick, rattling, or short, panting; difficulty of breathing; pulse weak, thready, and compressible; sometimes boring pain in the region of the heart; the expression of the face sad, depressed; pale, sunken features, pinched, and cold; lips blue; mouth dry or frothy; tongue dry and rough; papillæ enlarged; complete loss of appetite; great thirst for cooling drink; frequent nausea and constant vomiting; vomit frothy, mucous, or bilious; burning pain in the epigastric region; rumbling in the stomach, with a sensation of pressure at the pit of the stomach; stools profuse, gray, watery, with flocculent matter, and gushes out in stream; urine scanty or entirely suppressed; drowsy, without being able to sleep; icy coldness of the body, and cold sweat at night.

Dose: Dissolve five drops of the 3d or 6th dilution in a wineglassful of pure water, and give two teaspoonfuls every fifteen, twenty, or thirty minutes,

according to the severity of symptoms. This repetition of drug must be gradually at longer intervals as the severity of symptoms lessens. In cases of children the dose should be only one teaspoonful.

Arsenite of Copper.—Dr. Hale found that this drug is very useful in some cases of cholera. He says: "I first used it in some seven cases of cholera which occurred in the years 1866 and 1867. These cases were marked by the usual intestinal disorder, to which were added severe and painful cramps in the abdomen and extremities. The alternation of arsenicum and cuprum did not prove as satisfactory as I expected, but the use of cupric arsenite, in the sixth trituration, in water for children and dry on the tongue in adults, generally acted promptly. I can recommend it in cholera infantum, spasmodic and neuralgic pains in the bowels, accompanied by screams and cramps in the fingers and toes, attended with great debility and threatened collapse." The indications of the arsenite are those of arsenicum on one hand, that is, extreme prostration, etc., and those of cuprum on the other. I should prefer its administration when cupric symptoms are more pronounced, as violent, colicky, cutting, drawing pains in the abdomen, neither increased nor decreased by pressure, and violent spasms in the abdomen, upper and lower limbs, especially cramps in the fingers, toes, and calves, causing the patient to scream.

Dose: 3^{x} or 6^{x} trituration in water or dry on the tongue every half hour or hourly, according to the severity of the symptoms.

Veratrum Album.—Hahnemann has prescribed it for Asiatic cholera, and placed it among the best remedies for this disease. Subsequently the American and Russian practitioners have tried it in cases of cholera, and found that it acts satisfactorily in subduing copious watery vomiting and purging, with cramps in the extremities, and severe spasmodic colicky pain. I think its administration will be most effectual when there is suppression of the first stage of the disease and the disease at once commences with the second stage and creeps quickly on to collapse stage. All the symptoms are very rapid in their development, as well as severe. Dr. Hughes says: "Tendency to copious diarrhœa and vomiting, with prostration, fainting, coldness, and cold sweating. It will benefit almost every case, of whatever kind it may be."

Indications for its use: Anxious, restless, extreme prostration; inability to sit down, must lie down; sudden sinking of strength; vertigo; heaviness of head; faintness from least exertion; sometimes head hot, and the head covered with cold sweat; headache; face pale, distorted; blue rings around the eyes; look wild; nose more pointed and seems longer; of leaden hue and cold; eyes lustreless, lids livid, pupils contracted, and the patient fails to recognize near objects, or may do so but very slowly; sometimes lachrymation and the pupils dilated; gradual deafness of ear; lips are bluish and quite dry; grinding of the teeth; tongue dry, withered, and cold; may be coated, yellowish brown, and speech lisping, thick, and stammering;

mouth dry; saliva very much lessened, or sometimes constant flow of saliva, like water-brash; dryness of throat; bitter eructation; hiccough; nausea, with sensation of fainting and violent thirst; thirst for cold drinks; want everything cold; drinks frequently, but only small quantity at a time, and the thirst is not relieved by drink; violent vomiting, with continued nausea and great exhaustion; vomited matters are bile-stained, yellowish green, foamy, sometimes contain undigested food; painful retraction of abdomen during vomiting; sensation of distress in the pit of the stomach; pain in the epigastrium; burning pain in the abdomen; cutting, colicky pain, with nausea and vomiting; cold feeling and cold sweat in the abdomen; stools are watery, mixed with flakes, profuse rice-water discharges gush out like stream with considerable force; watery discharges are generally inodorous, green in color, and containing mucus, this being worse at night; sometimes unconscious discharge of the fæces; urine scanty and brownish or suppressed; pulse frequent, small or slow, soft, intermittent; circulation slower, almost at a standstill; coldness of the body all over; cold, clammy perspiration; distressing tonic cramps, commencing in the hands and feet and then gradually spreading all over the body; respiration labored, and sometimes dyspnœa.

Dose as for cuprum, and similarly repeated.

Xanthoxylum.—This is a new remedy which has gained some reputation in the treatment of cholera. Dr. Hale says: "The most important clinical fact rel-

ative to the use of this medicine is its efficacy in cholera."

"In Asiatic cholera," says King, "it was extensively used by many of the physicians in Cincinnati, and with great success. It acted like electricity, so sudden was its influence over the system; indeed, many patients likened it to an electric shock which seemed to diffuse itself through the whole frame. We gave it (the tincture of the berries) in teaspoonful doses, slightly diluted and repeated, according to circumstances, every five, ten, or fifteen minutes."

As regards the indications for its use nothing is particularly known, but Dr. Hale says that it is his conviction that the xanthoxylum acts in cholera in a manner quite similar to camphor and veratrum album. It seems to possess some of the properties of both drugs. It should be given when there are distressing cramps which resemble those of veratrum album, but have not subsided by its administration. And also it stimulates like camphor, hence may be tried in cold stage too.

Dose: The tincture of the berries may be given in teaspoonful doses, often repeated.

Croton Tiglium.—This remedy is most applicable in some cases when the stools are watery, yellowish, or watery mixed with whitish flakes and gush out like shot; there is a burning sensation in the anus, and a feeling of oppression at the umbilical region down to the anus, with fulness and distension of abdomen: griping pain and also gurgling in the intestines, mostly

on the left side. All these symptoms are aggravated by drink or food.

Dose as for cuprum.

Jatropha.—Easy vomiting of a large quantity of whitish, jelly-like substances, resembling white of egg; the contents of the rectum gush out like a torrent, and gurgling noise in the abdomen; anxiety, with burning pain at the pit of the stomach; anguish, with coldness of the body; cold, sticky sweat; violent cramps in the calves of the legs; pulseless, and great weakness.

Dose like cuprum.

Arsenicum Album is a very good remedy which greatly resembles veratrum album. The differences of indications between these two drugs are very few. In cases of arsenicum the symptoms are severe and develop rapidly. The special indications for this drug are: sudden and complete exhaustion; excessive, insatiable thirst, the patient, however, drinking only a small quantity at a time; burning sensation at the anus long after stool; tendency to pass into the stage of collapse quickly; many inexpressible troubles on the part of the patient; and the most characteristic distinction is that all discharges are scanty and excoriating. In some cases of arsenicum the patient may succumb after one or two evacuations. It also resembles, to some extent, camphor in the collapse stage. In veratrum album, on the contrary, there are excessive spasms, exhaustion in proportion to the vomiting and purging (in this drug the patient drinks a large quantity at a time), all dis-

charges are very profuse, and there is no excoriation.

Indications: Confusion of head and weakness of memory; intense anxiety, with restlessness, worse at midnight; the patient cannot find rest anywhere; constant tossing, change of place and feels extremely sad; vertigo; flickering before the eyes; weakness of sight; everything seems dim; pupils contracted or dilated; eyes sunken deep in the orbit, and blue margins around the eyes; ringing in the ears; the expression of the face anxious and distressing, pale, livid, bluish; grinding of the teeth; tongue dry and red, with papillæ considerably raised from the surface, especially at the tip; taste unpleasant, metallic, bitter or putrid; dryness of mouth, with violent thirst; throat also dry, and sensation of constriction, sometimes difficulty of swallowing and paralytic condition of the pharnyx and œsophagus; loss of appetite, with excessive thirst; drinks often, but a little at a time, and the drinking does not refresh; frequent hiccup; violent vomiting of food, this vomiting very much aggravated by eating or drinking anything; vomited matter is green-yellow liquid, sometimes black; pressure in the region of the stomach, and tenderness of the stomach on pressure, and also intense heat and burning in the stomach and at the pit; sometimes it is so severe that it arrests the breathing; rumbling in the bowels; violent pain in the abdomen, with great anxiety; pain about the navel; purging, with extreme coldness of the extremities; the stools are

slimy, green, mucous, black like dirty water, sometimes very offensive; urine scanty, sometimes a profuse discharge, turbid; retention of urine, threatening to uræmia; voice weak, hollow, hoarse, or loss of voice; respiration short, and difficulty of breathing; pulse accelerated, quick and small, rapid, very frequently irregular, thread-like, and often quite imperceptible at the wrists; external coldness, with cold, clammy sweat; cramps in the calves; twitching of the muscles; exhaustion from slightest exertion; the fingers and the toes are shrivelled, the nails and lips are blue; great emaciation; the muscles are relaxed and flabby; sleeplessness, with restlessness and moaning, and frequently startings during the sleep. All these symptoms are more marked at night.

Dose: One drop of the first or sixth dilution in a tablespoonful of pure water, every one, two, or three hours. Repeat at a longer interval as the symptoms get better.

Tabacum.—Nausea and vomiting if persistent after purging yielded, recurring in constant paroxysms with cold sweat; anguish and restlessness; emaciation and death-like pallor of the face, blue and pinched; great thirst; oppression in the stomach; nausea, worse on the least motion; spasm in the calves; icy coldness of the extremities; body might be warm or cold; cramps in the arms and hands. This remedy follows veratrum well. It is often indicated in collapse stage.

Dose same as arsenic.

Antimonium Tartaricum.—In some instances this drug may be indicated, especially when the irritation

of the intestinal canal is caused by some undigested food, and when there is congestion of the brain, giving rise to nervous symptoms. Indications for its use: Confusion of head; mental excitement; vertigo; headache, heaviness of head, with a great feeling of pressure extending downward into the left eye; painful sensation in the head, especially when moved; flickering before the eyes; dimness of vision; eyes tired, and inclination to close the lids tightly together; roaring in the ears; face pale, sunken, bluish; cold sweat on the face; sweat on the forehead and head; twitching of the muscles of the face; tongue reddish, dry, or thinly coated; taste bitter, sour; mouth sore, much thirst; drinks little and often; appetite lost; violent hiccup; empty eructation; nausea, vomiting; vomit watery, mucous, green, sometimes undigested food; after vomit great exhaustion; a sensation of overloading in the stomach; violent pain in the epigastrium; spasmodic pain in the stomach, same feeling in the abdomen, as if stuffed; violent colicky pain in the abdomen, especially around the umbilicus, with rumbling in the bowels; stools are watery and profuse, either yellowish or greenish; urine scanty; both the upper and lower extremities cold; the tips of the fingers and toes are wrinkled and dry, sometimes without sensation.

Dose same as arsenic.

Ipecacuanha.—When the other symptoms of this stage are not so marked, this remedy may be used with the following indications: constant nausea; vomiting of bile, of sour fluid, or of a dark-colored liquid; great thirst after vomiting; violent distressing pain in the

pit of the stomach; indescribable sick feeling in the stomach; griping and intensely sharp pain in the intestines, aggravated by movement.

Dose: One drop of the first or sixth dilution in an ounce of water, two spoonfuls every half-hour or hourly.

Generally these above remedies check the further progress of the disease; but in cases where still the worst symptoms are persistent we will keep on administering most of the remedies that we have used in the second stage, according to their indications. For in the early part of the third stage they will answer perfectly well, such as cuprum, arsenic, veratrum; but if still the disease creeps on towards worse and collapse sets in, we have to administer some other remedies according to their indications.

Camphor is a very good remedy for this stage, and I have given its indications for use in this stage (p. 91).

Aconite.—When the hands and feet are icy cold, and in fact icy coldness all over the body; cold, clammy perspiration here and there; general appearance bluish-looking; face pale; pupils contracted at first and then tendency to dilatation; roaring in the ears; mouth quite dry, and the tongue and lips are also dry; swallowing almost difficult; excessive, unquenchable thirst; hiccup; now and again scanty, loose, slimy or mucous stools and slight vomiting; gradual distension of the abdomen, with a feeling of uneasiness; voice has nearly suppressed; respiration labored, with oppression in the chest; pulse hardly percep-

tible and heart's action very slow—under these circumstances this remedy may be given to establish proper circulation and respiration, and thereby to raise the general temperature of the body and set a reaction.

Two cases in which there was a state of collapse, subjective and objective coldness, excessive thirst but inability to retain anything on the stomach, restlessness, two drops of tincture of aconite in half a tumbler of water, of this two teaspoonfuls as a dose, revived the patient at once, and convalescence was established. (C. W. Boyce, N. Y. St. Tr. p. 520.)

Dose: One or two drops of the tincture in six dessert-spoonfuls of water, two spoonfuls every fifteen minutes or half-hour, or still longer interval, according to circumstances.

Hyoscyamus.—This remedy will be well indicated when there is paralysis of the sphincter and unconscious passage of the fæces, half in bed and the other half retained in the rectrum, due to the inability of its muscular coat; the abdomen becomes distended and tympanitic, the muscles painful and integument slightly sensitive, and a feeling of oppression in the stomach and abdomen; there may be involuntary copious discharge or suppression of urine, generally the latter; stools are scanty; loss of senses; both hearing and sight are greatly impaired; delirious and slight unconsciousness; eyes look without lustre, and constant staring at surrounding objects, or sometimes eyelids are nearly closed; does not reply to questions, or does not recognize any one; body cold and pale all over; face blu-

ish; throat dry and parched; difficulty to swallow liquids; respiration labored and slow; tongue dry, hard, looks like leather; heart's action slow; pulse at the wrist scarcely perceptible—if any, small, weak, and irregular.

Dose like aconite; or, 1^{x} or 3^{x} may be given.

Carbo Vegetabilis.—This drug is often indicated for this stage, especially in some cases where there is stoppage of vomiting and purging, but occasional passage of stools; the stools are terribly offensive, putrid or smell cadaverous, and passed involuntarily, might contain pus, generally light-colored or yellow or pale, thin, frothy, mucous; gradual distension of abdomen; tympanitis; urine quite suppressed. Besides these the patient is pulseless, the face and limbs are cold, breathing short, breath cold, cold sweat here and there, vital forces nearly exhausted, and the patient lies as if dead.

Dose: A drop of third or sixth potency, or still higher, in a dessert-spoonful of water every ten, fifteen, or thirty minutes. Arsenic acts very well with carbo vegetabilis in this stage when given one or two doses as an intercurrent.

Acidum Hydrocyanicum.—This is considered one of the best remedies known for this stage. Dr. Sircar, who had a vast experience in India, speaks very highly of this drug. "Hydrocyanic acid," he says, "is useful, in fact is the only remedy when, along with pulselessness, the respiration is slow, deep, gasping, or difficult and spasmodic, taking place at long intervals, the

patient appearing dead in the intermediate time. If any remedy is entitled to be spoken of as a charm, it is this. It would seem at times to restore animation to a corpse." It has been highly praised by several other practitioners, who found the same satisfactory result from its use in this stage.

Indications for its use principally are the following: The general appearance of the body is death-like; there is no sign of animation in any part of the body except the gasping breath, which is slow, deep, and spasmodic in character; there might be snoring and frequent tendency to arrest the breath; the vital forces are nearly at a standstill; heart beats slowly; no pulsation at the wrists, or in some cases even at the brachial or carotid arteries; the general paleness of the skin all over, with a blue tinge, and icy coldness; the pupils are dilated, wide open, immovable, and insensible to light; sight obscured; there is thin, scanty, sometimes continuous passage of stool; urine is quite suppressed. In fact, the patient is threatened with death every moment.

Dose: One drop of the first in a dessert-spoonful of pure water every fifteen or twenty minutes.

Secale Cornutum.—This remedy may be used with great success in this stage, when there is persistent tonic or clonic spasm which has not been subdued by the administration of cuprum. Indications: Eyes sunken, surrounded by blue lines; dilated pupils, nearly immovable; confusion of hearing; stools scanty, offensive, slimy or watery, discharge involuntary, but

comes out with force; painless paralysis of the rectum; spasmodic distortion of the mouth and lips; dry tongue; sometimes spasm of the tongue, also spasmodic jerks of the hands, with flexion of the hands at the wrists, or of the forearms; fingers drawn in toward the palm; cramps in the calves, and the toes spasmodically drawn up towards the dorsum of the foot; in fact, painful contraction of all the flexor muscles; difficulty of breathing; respiration slow and labored; heart's action slow; pulse suppressed. This is especially useful in cases where there is extreme coldness of the body, with a sensation of heat on the part of the patient: he cannot bear any covering, and if any such thing be put on his body he throws it back and expresses signs of great anxiety. Depending mostly on this symptom, of course also with other graver symptoms of bad prognosis, Prof. Allen states that he treated an old lady, aged about eighty, of true Asiatic cholera, with thirtieth potency of this drug, with her complete recovery.

Dose: A drop of the first in two dessert-spoonfuls of water. Give two teaspoonfuls every fifteen minutes, or so, until the cramps subside.

Lachesis.—When the breathing becomes gasping, slow, and intermittent, and the life is threatened with asphyxia, with all other symptoms of this stage.

Dose: A drop of third dilution in an ounce of pure water, two teaspoonfuls every five or ten minutes.

Naja.—This remedy may be also given when the life of the patient is threatened with asphyxia, either due to

extreme exhaustion or impediment of pulmonary circulation by emboli. The most characteristic subjective symptom dyspnœa; this distressing struggle for breath is most agonizing.

Dose: This may be given in third trituration every fifteen minutes or so.

Crotalus Horridus.—This remedy has been strongly recommended by Professor S. P. Burdick, who tried it in several severe cases of cholera in late epidemics with great success. The special indication for its use is the distressing pain around the navel, with all other typhoid symptoms. Dose like Naja.

Cantharis.—This remedy is especially useful in cases of suppression and retention of urine, with or without delirium, convulsion, or coma. It is useful during the reaction stage when all other severe symptoms have abated and there is delay in the appearance of urinary secretion, with frequent desire to urinate.

Dose: One drop of the first or third dilution in a tablespoonful of pure water every hour.

Terebintha.—This drug is occasionally called for when cantharis has failed to produce urinary secretion.

Dose as cantharis.

Kali Bichro. may be sometimes used under the above circumstances. Dr. Hughes recommends this drug in cases of incontinence of urine in cholera.

When there is troublesome hiccups the following remedies may be given:

Agnus Castus.—When there is hiccup, nausea, and occasional vomiting.

Dose: One or two drops of the sixth, twelfth, or thirtieth dilution in a tablespoonful of pure water every one, two, or three hours.

Cicuta Virosa.—Violent hiccup, with spasm in the pectoral muscles; distortion of the eyes; difficulty of breathing, or convulsions.

Dose like agnus.

Ignatia.—Hiccup after eating and drinking, with gulping up of a bitter fluid or undigested food; nausea.

Dose like agnus.

Phosphorus.—Violent hiccup immediately after the meals.

Dose like agnus.

Belladonna.—Hiccup with half-suppressed eructation, especially useful in reaction stage.

Dose like agnus.

Pulsatilla.—Paroxysmal hiccups during sleep, after drinking, accompanied with sour eructation.

Dose like agnus.

Besides, carbo veg., sulphur, staphysagria, ruta, moschus, nux vomica, etc., are often indicated for hiccup.

In some cases sleeplessness becomes a troublesome symptom. The following medicines may be indicated for this purpose:

Belladonna.—Sleep is prevented by great anxiety; the patient feels sleepy but cannot sleep; congestion of the blood-vessels of the conjunctiva; the pupils are dilated; sometimes dreams, and a feeling of uneasiness in the morning connected with disturbed sleep.

Dose: One or two drops of the sixth, twelfth, or thirtieth dilution in a tablespoonful of pure water, twice or thrice daily, or still oftener.

Chamomilla.—Restless at night, with eyes half open; cannot sleep, though the patient feels sleepy and tosses about.

Dose like belladonna.

Coffea.—When there is great excitement, due to which the patient cannot sleep.

Dose like belladonna. But higher dilutions act better.

Hyoscyamus.—Sleeplessness, with excessive irritability; constant slumber; the patient falls asleep and wakes up in a minute; stupid and drowsy looking.

Dose like belladonna.

Besides, kali carb., nux vomica, opium, rhus, arsenic, etc., may be used.

China is a very good remedy in quiet convalescence, when the patient complains of great weakness; vertigo; ringing in the ears; pale face; loss of appetite, with or without diarrhœa; tongue coated white; taste bitter.

Dose: One drop of the first, sixth, or thirtieth potency in a tablespoonful of pure water every three or four hours.

Phosphorus.—In reaction stage when all other symptoms have abated, but brownish discharge from the bowels continues for too long a period, then this remedy may be given to moderate the discharge.

Dose: One drop of the third, twelfth, or thirtieth,

potency in a tablespoonful of water after every evacuation.

Phosphoric acid may be given with same indications as phosphorus, and in the same dose. Here the prostration is less than phosphorus.

Podophyllum. — Yellow-colored fetid discharge, painless, watery; or the fæces may be covered with mucus; worse in the morning.

Dose: A drop of the sixth, twelfth, or thirtieth potency in a tablespoonful of water four times in a day.

Nux Vomica.—Diarrhœa alternate with constipation; tympanitis; small, scanty mucus stool, and a feeling of dissatisfaction after evacuation.

Dose like podophyllum.

Mercurius.—When stools contain mucus or blood; clay-colored and offensive, due to defective secretion of the liver: though its action on the liver is doubtful, for Prof. T. F. Allen says that mercurius has no action on the liver.

Dose like podophyllum.

Nitric Acid.—Stools scanty, with tenesmus; may contain mucus or blood; putrid; taste bitter after eating, and cadaverous smell from the mouth.

Dose like podophyllum.

Sulphuric Acid.—Painless diarrhœa, with great debility; sour eructation and a sense of weakness all over the body; yellow-colored stools.

Dose like podophyllum.

Besides, sulphur, aloes, argent nitr., arsenicum,

benzoic acid, carbo veg., colocynth, croton tig., gelseminum, kali carb., lycopodium, rhus tox., veratrum al., etc., may be indicated.

Sometimes our attention may be called to complicated cases of fever during convalescence.

Aconite.—Burning heat, especially in the head and face; pain in the limbs; shivering over the limbs, chiefly in the evening after lying down; redness of cheek; cannot bear to be covered during the hot stage; dry, burning skin, with excessive thirst; pulse hard, strong, and accelerated; tongue white; great anxiety.

Dose: One or two drops of the 6th, 12th, or 30th potency, in a tablespoonful of pure water, every two or three hours.

Belladonna.—Congestion of blood in the head, with coldness of extremities; worse in the evening or at night, and fever commencing with rigors; little or no thirst; headache; burning in the stomach; dimness of sight; pupils dilated; delirium; sweat generally begins on the face; sleeplessness; pulse quick and strong; there may be loss of consciousness. These symptoms are more or less connected with brain trouble.

Dose same as aconite.

Eupatorium Perfoliatum.—This is a very good remedy when the fever is connected with the gastro-hepatic system. Thirst several hours before the chill and continues after it; aching and soreness in the back and limbs; constant nausea, retching, and vomiting of bile; violent colicky pain in the abdomen, with throbbing headache, especially occipital; tongue white or

yellowish; taste bitter. There may be morning diarrhœa or constipation.

Dose same as aconite.

But when the fever is complicated with disorder of the stomach, arsenic, nux vomica, and bryonia are indicated; when the source of the trouble lies in the small intestine, mercury and bryonia; the liver, bryonia, nux vomica, podophyllum; the colon, mercury, nux, ipecac, and carbo veg.; and when lungs are complicated, bryonia and phosphorus, etc.

In the treatment of the typhoid state of cholera the following remedies are usually indicated: opium, hyoscyamus, rhus tox, stramonium, zincum, cuprum; lachesis, arsenic, carbo veg., etc.

Opium.—Unconsciousness; stupor; can scarcely be roused; speechless or loud talking; mild delirium; staring look; the pupils are dilated or contracted, and insensible to light. Dryness of the lips, mouth, and throat; may be involuntary discharge of large quantity of urine or retention of urine; breathing rattling, stertorous, or snoring in character, with wide-open mouth. Pulse imperceptible; convulsive movement of the limbs; constipation or involuntary offensive watery stools.

Dose: One drop of the 6th, 12th, or 30th potency in a tablespoonful of water every fifteen minutes, thirty minutes, or hourly.

Hyoscyamus.—Stupor; loss of consciousness; cannot recognize any one; does not answer questions when asked; restless, and tries to get out of bed; red

face, and red, sparkling eyes; pupils dilated; constant staring at surrounding objects, and sometimes rolling of the eyeballs in the orbits; stools involuntary; urine scanty, and passed involuntarily; trembling of the arms and hands; sleeplessness, or constant sleep with muttering; coma vigil; pulse small, weak, scarcely perceptible.

Dose like opium.

Rhus Tox.—Restless sleep; constant restlessness, tossing about; absence of mind; forgetfulness; delirium; talks much to himself; answers correctly but slowly; tongue and mouth dry, with much thirst; abdomen bloated; involuntary discharge of cadaverous-smelling mucous stools, especially at night; heart's action very feeble.

Dose like opium.

Stramonium.—Loss of consciousness; hallucinations; strange, absurd ideas; singing; laughing; eyes wide open, staring; pupils dilated, immovable, and insensible to light; spasmodic distortion of the face; grinding of the teeth; loss of speech and hearing; face pale; foul, smelling stools; absence of urinary secretion, or once in a while profuse involuntary discharge of urine; breathing short and difficult.

Dose like opium.

Bryonia.—Rush of blood to the head; confusion of head; headache worse by the slightest motion; irritability of temper; dryness of tongue, mouth and lips, without any thirst or sometimes with thirst, relieved by drink; distention of the stomach and wind eructa-

tion; tenderness in the epigastrium; rumbling and gurgling in the bowels; great sensitiveness of the abdomen; sleeplessness on account of uneasiness; night restless, disturbed by frightful dreams.

Dose like opium.

Zincum.—Unconsciousness; weak memory; twitching of the muscles; staring eyes; delirium; attempt to get up in bed; small, frequent pulse, scarcely perceptible; tongue dry; does not want to talk; scanty, involuntary stools.

Dose like opium.

Lachesis.—Complete insensibility; weakness of memory; muttering, delirium, especially at night; redness of the eyes, with ulceration of the cornea; cannot bear light at all; thin, offensive stools; restless sleep, with many dreams, or persistent sleeplessness; impaired sensibility of touch in the distal extremities, with the commencement of gangrene.

Dose like opium.

Cuprum, arsenic, carbo veg., and other drugs that are used in typhoid fever may be indicated.

For the uræmic symptoms the following remedies may be advantageously administered: opium, hydrocyanic acid, hyoscyamus, arsenic, cuprum; and Boehr says lactuca virosa, agaricus, anacardium, etc., may be used.

Opium has been recommended by Boehr and Hughes in cases of uræmia; vertigo; loss of consciousness; delirious; pupils dilated, insensible to light; violent roaring in the ears, deafness; cold sweat on the fore-

head; dryness of the tongue, mouth, and throat; nausea and vomiting, or sometimes purging; complete suppression of urine; respiration slow and stertorous; great drowsiness; can hardly keep awake; sometimes snoring, with eyes half open.

Dose: One drop or two of the 6th, 12th, or 30th potency in a tablespoonful of water every fifteen, twenty, or thirty minutes, or at a still longer interval.

Hydrocyanic Acid.—Giddiness; oppressive pain in the head; loss of sight or dimness; great prostration; nausea; sometimes vomiting of black fluid; face pale, and the general surface looks bluish; respiration slow, deep, and frequent arrest of breath; diminished action of the heart, gradually approaching to paralysis.

Dose like opium.

Hyoscyamus.—Delirious; picking at the bedclothes; vertigo; confusion of ideas; stupor; loss of sight or smell; pupils dilated; dryness of the tongue, mouth, lips, and fauces; retching and vomiting; sometimes involuntary stools; suppression of urine.

Dose like opium.

In the ulceration of the cornea local medicines and proper bandaging are of the greatest importance. Internal remedies.

Cinchona.—In the early stage; great prostration; dimness and weakness of sight; cannot bear strong light; intermittent pain; and there is ringing in the ears.

Dose: One or two drops of the 6th or 30th potency in a tablespoonful of water every two or three hours.

Calcarea Carb.—Opacity of the cornea; profuse lachrymation; commencement of ulceration; slight or no pain; sensitiveness to light; photophobia.

Dose like cinchona.

Arsenicum. — Feeling of sand in the eyes; burning; weakness of sight; sensitive to light; photophobia; trembling of upper lid, with lachrymation.

Dose like cinchona.

Conium.—Superficial ulceration, with photophobia and lachrymation. The ulcerations are non-inflammatory in character.

Dose like cinchona.

Graphites.—Superficial or deep ulcerations, with profuse lachrymation and photophobia; this lachrymation increases in the open air; burning and aching pain in the eyes; intolerance of light.

Dose like cinchona.

Hepar Sulph.—Ulcers on the cornea; aching pain from daylight, and also when moved; sight becomes dim; a feeling of pressure as from sand.

Dose like cinchona.

Aurum, argentum nitr., mercurius, sulphur, phosphorus, euphrasia, lycopodium, apis, pulsatilla, carbo veg., etc., may be indicated.

In cases of gangrene, arsenicum, china, crotalus, lachesis, secale cor., silicea, etc., should be given.

Arsenicum.—Insensibility of the distal parts, with slight swelling and pain; breaking out of reddish spots or bluish blisters; dryness of the body, etc.

Dose: One or two drops of the 6th or 30th potency

in a tablespoonful of water, every three or four hours.

China.—When there is great debility, coldness of the whole body, particularly the extremities; there may be vomiting and hiccup.

Dose like arsenic.

Crotalus.—Painful numbness of the toes; gangrene more general; insensibility of the swollen part; the swollen part is cold, and painful to pressure. Pulse imperceptible.

Dose like arsenic.

Carbo Veg. is used when there is general gangrene.

Lachesis is used when the gangrene has far advanced. So is secale cor.

In cases of boils and carbuncles, Professor Helmuth says that berberis vulgaris is an excellent medicine to hasten suppuration in boils, and its proper administration removes the predisposition to them.

The medicines that are used for boils are arnica, belladonna, calc, hep., mercurius, nitric acid, thuja, etc.

The medicines for carbuncles generally used are arsenicum, belladonna, hyoscyamus, china, rhus tox, muriatic acid, etc.

Arsenicum.—When there is great prostration, emaciation, vomiting, burning thirst; pulse small, irregular, and frequent, and the carbuncle more of a diffusive character.

Dose: One or two drops of the 6th or 30th potency in a tablespoonful of water every three or four hours.

Belladonna.—When the brain symptoms are more pronounced, with a tendency to spread rapidly.

Dose like arsenic.

Rhus Tox.—When there is extreme painful sensation around the seat of carbuncle, with pale face, stupor, convulsions.

Dose like arsenic.

Hyoscyamus is useful in nervous persons; muriatic acid in scorbutic and china in asthenic character of the disease.

XV. Diet.

In the diarrhœal stage the food should be easily digestible and nutritious. No coffee, tea, or fermented liquors. Barley-water, lemonade, or iced water may be given in moderation as a drink. A little arrow-root, milk, beef-tea, or chicken broth may be given before the commencement of the vomiting, for when this symptom commences there is no use of giving any sort of diet, though this may be tried, but it seems to me quite ineffectual. But when the disease has fully developed, cold-water drink and sucking of ice will greatly relieve the excessive thirst, so this may be given freely. In the stage of reaction particular care should be taken in diet; any mismanagement of diet would give rise to troublesome symptoms. Extract or essence of beef, beef-tea, mutton or veal broth or chicken broth, and by and by eggs and toasted bread, etc., may be given. A little brandy or

port wine and egg mixtures will do in some cases nicely. No vegetables, unripe fruits, or sour fruits or pastry, should be given. When the reaction has established, soup, chicken and rice, or fowl and rice, provided that it is not highly seasoned, should be given. Light puddings, as rice pudding, baked bread pudding, boiled custard pudding, and stewed fruits, calf's-foot jelly, bread jelly, or port-wine jelly, may be given.

THE METHOD OF PREPARING SOME OF THE ABOVE DIETS.

1. *Essence of Beef.*—Take one pound of juicy beef, free from fat and skin; chop it up very fine, add a little salt, and put it into an earthen jar with a lid; cement the edges of the cover with a thick paste, and place the jar in the oven for three or four hours. Strain off the liquid essence through a coarse sieve, and give the patient one or two teaspoonfuls at a time.

2. *Extract of Beef.*—Take one pound of fresh beef, free from fat, mince it thoroughly, and add a pint of cold water. Place it in a pot at the side of the fire to heat very slowly. It may stand two or three hours before it is allowed to simmer, and then let it boil gently for fifteen minutes. Either you may skim or strain off the liquid extract; and then give the patient one or two teaspoonfuls at a time.

3. *Beef Tea.*—1. Take one pound of beef, without fat, mince it fine and put it into a common earthen pot, with a pint and a half of cold water. Stand the

pot on the hob, so that it may simmer for three or four hours. Strain, and give the patient two or three teaspoonfuls or more at a time.

Another way of preparing:

2. Take two pounds of beef, without fat or bone, put it in a jar with two or three ounces of cold water, and place the jar in a saucepan of water. Simmer for four hours, and so on.

4. *Mutton or Veal Broth.*—Take of mutton or veal two pounds, cold water two pints, a little salt and pepper, and one or two ounces of rice. Simmer three or four hours and boil for a few minutes; strain, and remove all the fat before serving.

In cases of chicken, take half a chicken (about a pound and a half), with the bone well broken.

5. *Eggs and Brandy.*—Beat up three or four eggs to a froth in four or five ounces of spring water, add two or three lumps of sugar, and pour two or three ounces of brandy, stirring all the time. A portion of it must be given at a time.

6. *Port Wine and Eggs.*—Beat up an egg with a fork till it froths, add a lump of sugar and two spoonfuls of water, mix up thoroughly well, pour in a wineglassful of port wine, and serve.

7. *Chicken and Rice.*—Cut up the meat of chicken, some rice, put a little salt, pepper, and some water, and get them well cooked.

Another way:

Cut up the meat of boiled chicken. Have ready some rice well cooked and seasoned with salt, put

round a small flat dish, warm up the chicken in a little good gravy, and serve in the middle of the dish with the rice round it.

8. *Rice Pudding.*—One ounce of rice, twelve ounces of milk, half an ounce of butter, one egg, and a little sugar. Let the rice swell in the milk over a slow fire, stir in butter, and then let the mixture cool. Well beat the egg, and mix with the rice. Butter a cup, fill it three parts full, and bake.

9. *Baked Bread Pudding.*—Half a tumbler of fresh milk, a quarter of a pound of bread crumbs, two eggs, one ounce of butter, a little sugar.

Boil the milk, pour it over the bread crumbs, and let them soak for half an hour. Beat the eggs, mix them with the bread crumbs and the sugar and butter, and stir well till thoroughly mixed. Butter a small pudding mould, fill it half full with the mixture, and bake in a gentle fire for about twenty minutes.

10. *Boiled Custard Pudding.*—Beat two eggs, pour half a pint of warm milk to them, stirring all the while. Butter a small basin that will exactly hold it, put in the custard, and tie a floured cloth over it; plunge it into boiling water, float it about for a few minutes, boil it slowly for half an hour.

11. *Bread Jelly.*—Take a quantity of the soft part of a loaf, and cover it with boiling water and allow it to soak for some hours. Then to be strained off completely and fresh water added. Place the mixture on the fire, and allow it to boil for some time until it becomes smooth; the water is to be pressed out, and the

bread on cooling will form a thick jelly. This can be used with sugar and milk.

12. *Port Wine Jelly.*—Put into a jar one pint of port wine, two ounces of gum arabic, isinglass (gelatine), and sugar, a quarter of a nutmeg grated fine, and a small piece of cinnamon. Let this stand closely covered all night. The next day put the jar into boiling water, and let it simmer till all is dissolved, then strain it, let it stand cold, and then cut it up into small pieces for use.

A short table showing the death per cent under the homœopathic treatment:

Name of the Place.	No. of Cases.	Death.	Rate per cent.
Vienna.....	581	49	8
Vienna.....	998	95	9½
Prague in Moravia, etc..	1,269	85	6¾
In Russia and Austria..	2,753	264	9½
Russia.....	1,270	108	8½

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